Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/12**

Paper 1 Multiple Choice **February/March 2018**

1 hour

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

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READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.

This document consists of **15** printed pages and **1** blank page.

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1 The eyepiece lens of a microscope can be fitted with an eyepiece graticule.

Which of these statements about eyepiece graticules are correct?

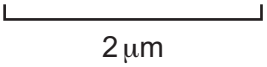
1 They measure the actual length of cells in micrometres.

2 They help biologists to draw cells with correct proportions.

3 They change in size when the objective lens is changed from ×10 to ×40.

A 1, 2 and 3 **B** 1 and 3 only **C** 1 only **D** 2 only

2 A student was asked to use the scale bar shown to calculate the magnification of a cell on a photomicrograph.



Which method could the student use to calculate the magnification of the cell?

A divide the diameter of the cell by the length of the scale bar, both measured in the same units of length

B measure the diameter of the cell in millimetres, multiply by 2000 and divide by the length of the scale bar measured in millimetres

C measure the length of the scale bar in millimetres, convert to micrometres and divide by 2

D measure the length of the scale bar in millimetres, convert to micrometres and multiply by 2

3 Which eyepiece and objective lens combination of a light microscope allows the greatest number of cells in a field of view to be seen?

	eyepiece lens	objective lens
A	×5	×10
B	×5	×40
C	×10	×10
D	×10	×40

4 Which row correctly matches each cell structure with its function?

	microtubules	rough endoplasmic reticulum
A	allow vesicles to move within the cell	synthesises amino acids
B	form cilia and centrioles	produces ribosomes
C	form the spindle during prophase	transports proteins
D	move chromosomes during anaphase	makes triglycerides and phospholipids

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5 Which animal cells would have the most extensive Golgi bodies?

A ciliated epithelial cells

B goblet cells

C red blood cells

D smooth muscle cells

6 Which of these processes will require ATP?

1 transport of water in the xylem

2 semi-conservative replication of DNA

3 facilitated diffusion of amino acids into the cell

A 1, 2 and 3 **B** 1 and 2 only **C** 2 and 3 only **D** 2 only

7 Which concentrations could be produced by a serial dilution of an 8.00% glucose solution?

A 4.00%, 2.00%, 1.00%, 0.50% and 0.25%

B 4.00%, 3.00%, 2.00%, 1.00% and 0.00%

C 6.00%, 4.00%, 2.00%, 1.00% and 0.50%

D 8.00%, 6.00%, 4.00%, 2.00% and 0.00%

8 A student wrote these statements about polysaccharides.

1 Amylose is formed from condensation reactions between β-glucose monomers.

2 Branches in amylopectin molecules form between carbon atoms 1 and 4 on α-glucose molecules.

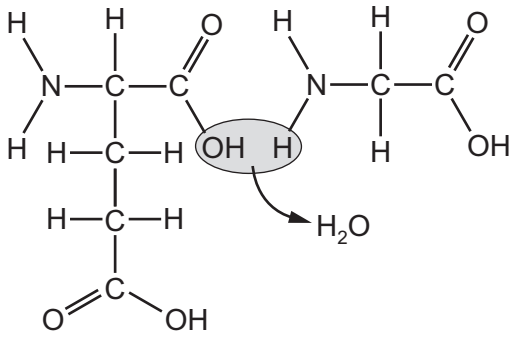
3 In unbranched β-glucose chains, each monomer is rotated 180° relative to its adjacent monomer.

Which of these statements are correct?

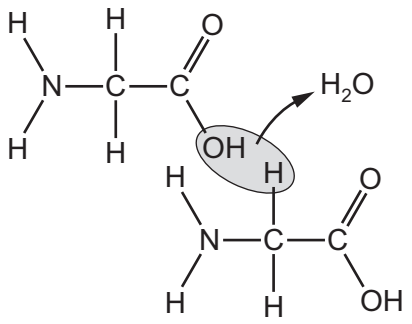
A 1 and 2 **B** 1 only **C** 2 and 3 **D** 3 only

9 Which diagram correctly shows the formation of a peptide bond between two amino acids?

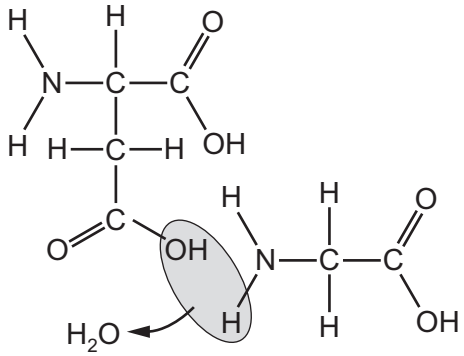
A



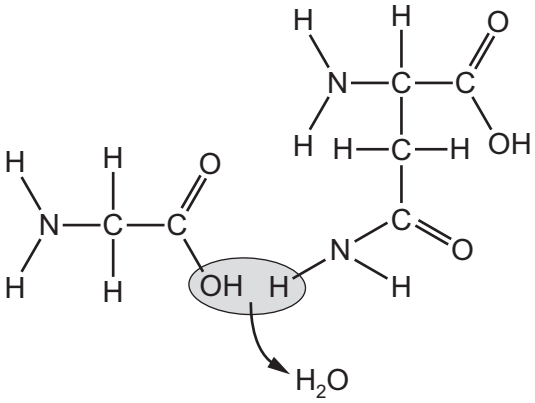
B



C

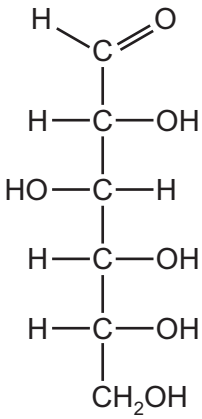


D



10 Sugars with a ring structure can also have a linear structure.

Which sugar molecules could be represented by the linear structure shown in the diagram?



A α-glucose, deoxyribose and ribose

B α-glucose only

C deoxyribose and ribose only

D deoxyribose only

11 Which molecules are globular proteins?

1 amylase

2 haemoglobin

3 DNA polymerase

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 only

12 When hydrolysed, which molecules have products containing a carboxyl group?

1 phospholipids

2 polysaccharides

3 proteins

A 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 3 only

13 Lysosomes contain many different hydrolytic enzymes that may act within cells (intracellular enzymes) or outside cells (extracellular enzymes).

Which process must occur in order for lysosomal enzymes to act outside the cell?

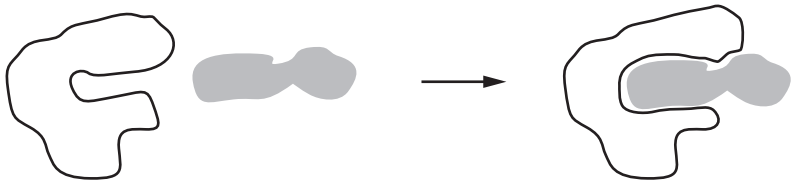
A active transport

B endocytosis

C exocytosis

D phagocytosis

14 The diagram shows an enzyme, its substrate and an enzyme/substrate complex.



Which statement explains how the substrate is able to enter the active site of the enzyme?

A Contact between the substrate and the enzyme causes a change in the enzyme shape.

B The shape of the active site and the shape of the substrate are complementary.

C The substrate within the active site forms hydrogen bonds with amino acids.

D When the enzyme/substrate complex forms, the tertiary structure of the enzyme changes.

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15 What could be used to calculate the rate of an enzyme-catalysed reaction?

1 the appearance of product

2 the disappearance of substrate

3 the Michaelis-Menten constant (K_m)

A 1 and 2 **B** 1 and 3 **C** 1 only **D** 2 and 3

16 Cholesterol is an integral component of the cell surface membrane.

Which statement about cholesterol is correct?

A It allows ions to pass freely through the cell surface membrane.

B It has a hydrophobic head and a hydrophilic tail.

C It helps to regulate the fluidity of the cell surface membrane.

D It reduces the mechanical stability of the phospholipid bilayer.

17 Which type of bond in phospholipids has a role in increasing the fluidity of cell surface membranes?

A C—C

B C=C

C C—O

D C=O

18 Which of these substances can pass directly through cell surface membranes without using a carrier protein or a channel protein?

1 Ca^{2+}

2 CO_2

3 $C_6H_{12}O_6$

A 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 2 only

19 Companion cells use ATP to move hydrogen ions out of the cell and co-transporter proteins to allow hydrogen ions to return with sucrose molecules.

Which two processes are involved in this movement?

A active transport and diffusion

B active transport and facilitated diffusion

C exocytosis and diffusion

D exocytosis and facilitated diffusion

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20 How many copies of each different DNA molecule will be found in a cell at the start of each of these stages of the mitotic cell cycle?

	G_2 of interphase	prophase	cytokinesis
A	1	1	2
B	1	2	1
C	2	1	2
D	2	2	2

21 Three parts of a chromosome and their functions are listed.

part

P1 centromere

P2 histone proteins

P3 telomere

function

F1 packages DNA into compact structures

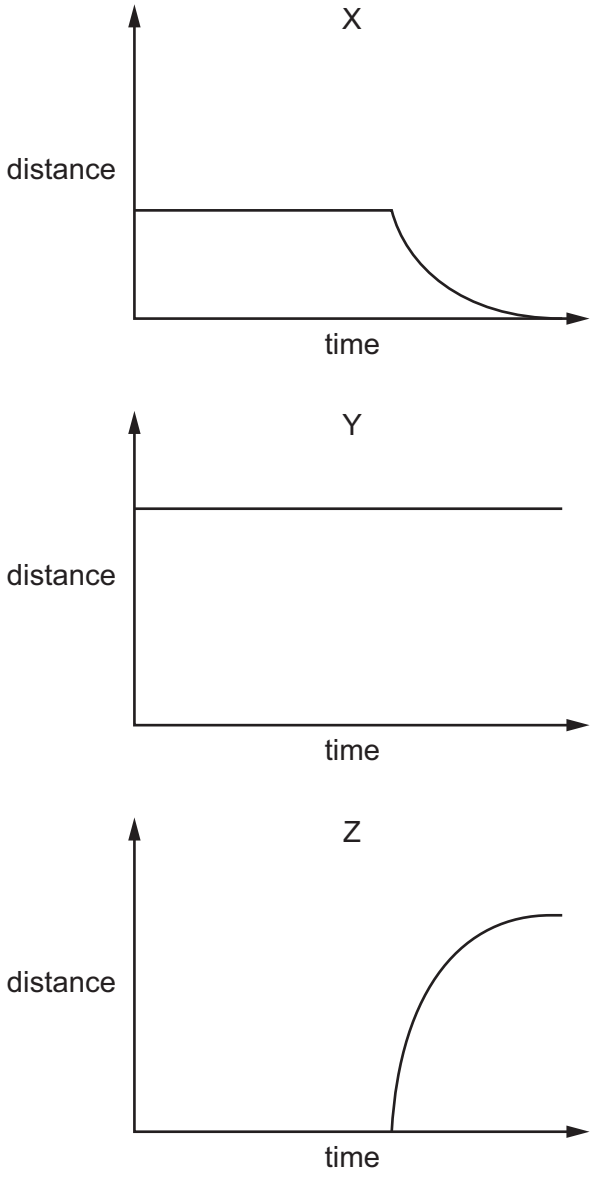
F2 holds two chromatids together

F3 prevents loss of genes

Which combination is correct?

A P1 and F1 **B** P1 and F3 **C** P2 and F2 **D** P3 and F3

22 The graphs show various distance measurements taken from metaphase of mitosis onwards. The graphs are to scale when compared to one another.



Which row correctly identifies the distance measurement for each graph?

	X	Y	Z
A	distance between poles of spindle	distance between sister chromatids	distance of centromeres from poles of spindle
B	distance between poles of spindle	distance of centromeres from poles of spindle	distance between sister chromatids
C	distance of centromeres from poles of spindle	distance between poles of spindle	distance between sister chromatids
D	distance of centromeres from poles of spindle	distance between sister chromatids	distance between poles of spindle

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23 A culture of bacteria was allowed to reproduce using nucleotides containing the heavy isotope of nitrogen (^{15}N). After several generations, all of the bacterial DNA molecules contained heavy nitrogen.

DNA was extracted from a sample of the culture, mixed with caesium chloride solution and spun at high speed in a centrifuge. In this process, DNA molecules of different masses separate into bands at different positions in the centrifuge tube. The heavier the DNA molecules, the closer to the bottom of the centrifuge tube that a band forms.

The diagram shows the position of the DNA molecules containing heavy nitrogen in the centrifuge tube.



The culture of bacteria was then allowed to reproduce using nucleotides containing the light isotope of nitrogen (^{14}N).

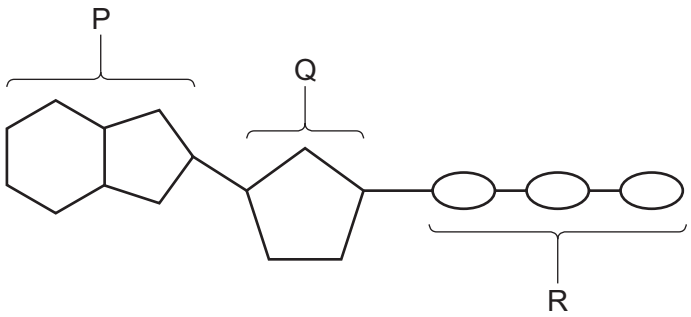
DNA samples were taken and separated by centrifugation after the bacteria had divided once and again after the bacteria had divided twice.

In which positions would the DNA be found after the cells had divided once and after the cells had divided twice?

	after dividing once	after dividing twice
A	half at K and half at L	quarter at K, quarter at M and half at L
B	half at K and half at M	quarter at K, quarter at M and half at L
C	all at L	half at K and half at L
D	all at M	half at L and half at M

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24 The diagram represents a molecule of ATP.



What are the components of ATP labelled P, Q and R?

	P	Q	R
A	adenine	deoxyribose	phosphates
B	adenosine	pentose	a phosphate group
C	adenosine	ribose	phosphorus
D	purine	pentose	phosphates

25 The table shows three anticodons for different amino acids.

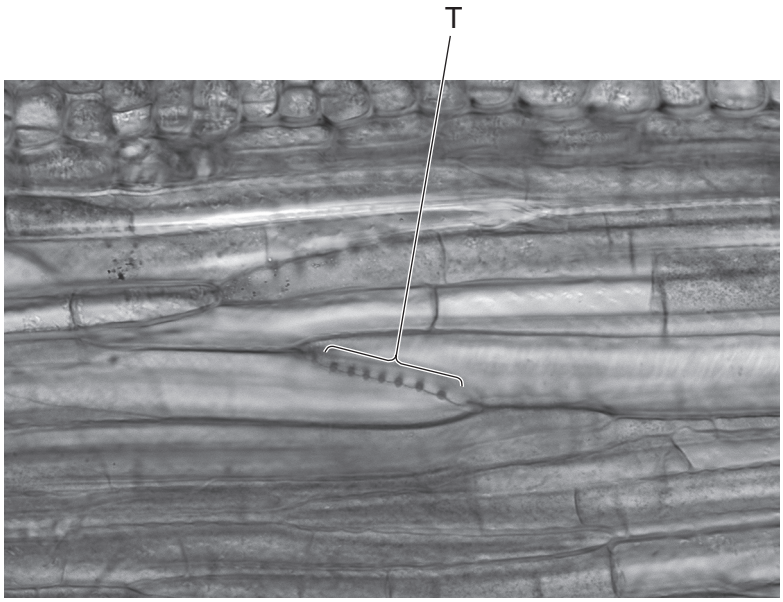
amino acid	anticodon
alanine	CGU
histidine	GUA
serine	UCA

Which DNA triplet on the DNA template strand codes for the amino acid serine?

A AGU **B** TCA **C** TGT **D** UCA

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26 The photomicrograph shows a transport tissue in the stem of a grape vine.



What is the structure labelled T?

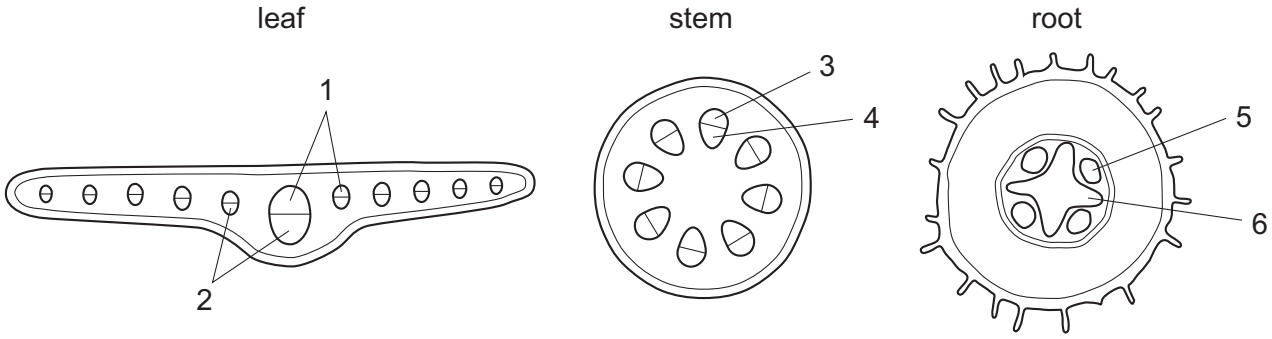
A companion cell

B sieve plate

C sieve tube element

D xylem vessel element

27 The diagrams show transverse sections of parts of a plant. Transport tissues are labelled 1 to 6.



Which row shows tissues that mainly transport water and tissues that mainly transport sucrose?

	mainly transport water	mainly transport sucrose
A	1 and 3	4 and 6
B	2 and 3	4 and 5
C	3 and 5	2 and 6
D	4 and 6	2 and 3

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[Turn over

28 What will increase the rate of transpiration?

1 increasing the humidity

2 increasing the light intensity

3 decreasing the temperature

4 decreasing the wind speed

A 1, 2 and 3 **B** 1, 3 and 4 **C** 2 only **D** 4 only

29 Which properties of water are important for transport in xylem?

1 cohesion

2 adhesion

3 high energy requirement for evaporation

4 good solvent properties

A 1, 2 and 4 **B** 1 and 4 only **C** 2, 3 and 4 **D** 2 and 3 only

30 Which statement about the blood flow in the cardiac cycle is correct?

A Blood flows into the aorta through the semilunar valve due to contraction of the right ventricle.

B Blood flows into the left atrium through the pulmonary artery when the wall of the left atrium relaxes.

C Blood flows into the right atrium through the vena cava when the wall of the right atrium relaxes.

D Blood flows into the right ventricle through the semilunar valve due to contraction of the right atrium.

31 Which of these statements about the formation of haemoglobinic acid are correct?

1 It depends on the formation of carbaminohaemoglobin.

2 It removes excess hydrogen ions preventing the blood becoming too acidic.

3 It is linked to the action of carbonic anhydrase.

A 1, 2 and 3 **B** 1 and 2 only **C** 1 only **D** 2 and 3 only

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32 What can combine with the haem group of a haemoglobin molecule?

1 oxygen

2 carbon dioxide

3 carbon monoxide

A 1, 2 and 3 **B** 1 and 3 only **C** 2 and 3 only **D** 3 only

33 Which factors would help a person to adjust from living at a low altitude to living at a high altitude?

1 formation of fewer red blood cells

2 an increase in the oxygen-carrying capacity of the blood

3 an increase in the output of blood by the heart

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

34 Chronic obstructive pulmonary disease (COPD) includes bronchitis and emphysema.

Which symptom is specific to emphysema?

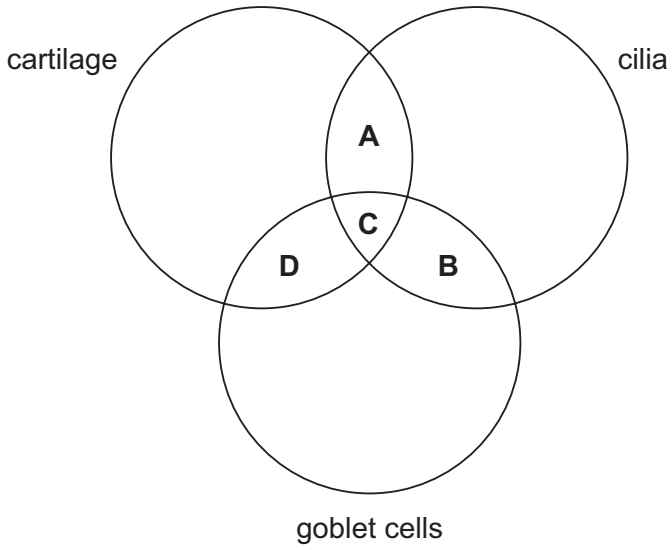
A excess mucus secretion by the goblet cells

B inflammation of the bronchial epithelium

C loss of elasticity of the alveolar walls

D thickening of the smooth muscle of the bronchi

35 What identifies the structures present in a bronchus?



36 Which of these terms can be used to describe the role of mosquitoes in the transmission of malaria?

1 malarial parasite

2 pathogen

3 vector

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 3 only

37 Bacteria that infect skin wounds can become resistant to the antibiotic commonly used to kill them.

Which statement explains how these bacteria could become resistant to the antibiotic?

A Exposure to the antibiotic causes a change in the bacterial cell wall, preventing the antibiotic from working.

B Other bacteria that normally protect the skin against infection are killed by the antibiotic, allowing the infectious bacteria to survive.

C Random mutations in DNA allow some of the bacteria to survive in the presence of the antibiotic.

D The antibiotic causes the bacterial DNA to mutate, allowing the bacteria to survive in the presence of the antibiotic.

38 Some children are born with severe combined immunodeficiency (SCID).

Children with this inherited disease do not normally have any T-lymphocytes and suffer from many infectious diseases.

How may these children be cured from SCID?

A transfusion of antibodies

B treatment with stem cells

C use of different antibiotics

D vaccination against all diseases

39 The hybridoma method is used for the production of monoclonal antibodies.

Which two types of cell are used in this method?

A stem cell and B-lymphocyte

B stem cell and T-lymphocyte

C tumour cell and B-lymphocyte

D tumour cell and T-lymphocyte

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40 A vaccine is used to create artificial active immunity. After being given a vaccine, it will take a period of time before a person develops long-term immunity against the disease.

Which statement about this period of time explains this delay?

A No memory cells have been produced from B-lymphocytes.

B No plasma cells have been produced from B-lymphocytes.

C The primary immune response has not produced enough antibodies.

D The secondary immune response has not produced enough antibodies.

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