Biology HL P1

2006 November

School Level 12th IB Diploma Programme

Board Exam

International Baccalaureate (IB Board)

Solved

IB DIPLOMA PROGRAMME
PROGRAMME DU DIPLÔME DU BI
PROGRAMA DEL DIPLOMA DEL BI

N06/4/BIOLO/HPM/ENG/TZ0/XX+

88066001

BIOLOGY
HIGHER LEVEL
PAPER 1

Thursday 16 November 2006 (afternoon)

1 hour

INSTRUCTIONS TO CANDIDATES

- Do not open this examination paper until instructed to do so.
- Answer all the questions.
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.

1. What are organelles?

A. Small structures in the cytoplasm of a cell that all have more than one function.

B. Membrane-bound structures found near the nucleus of all cells.

C. Discrete structures found inside all cells that have specific functions.

D. Specialized cells inside an organ that have one function.

2. Which organelles have a transport function?

A. Ribosome and Golgi apparatus

B. Golgi apparatus and endoplasmic reticulum

C. Mitochondrion and endoplasmic reticulum

D. Mitochondrion and ribosome

3. Which statements are characteristics of diffusion through membranes?

I. Polysaccharides can be transported.

II. It can be facilitated by special channels.

III. It is affected by concentration gradients.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

4. Which compounds are both organic **and** found in living organisms?

	Glucose $C_6H_{12}O_6$	**Carbon dioxide CO_2**	**Urea $OC(NH_2)$**	**Calcium Carbonate $CaCO_3$**
A.	✓	×	×	✓
B.	×	✓	✓	×
C.	✓	×	✓	×
D.	✓	✓	✓	✓

Key: ✓ = present × = absent

5. What is an active site?

A. The part of an enzyme that binds only to the product molecules.

B. The sequence of amino acids responsible for the catalytic activity of enzymes.

C. The sequence of amino acids responsible for the structure of an enzyme.

D. The specific area responsible for the activity of all proteins.

6. Why is pectinase used in fruit juice production?

A. To increase the yield and decrease the cloudiness

B. To increase the yield and decrease the sugar content

C. To increase both the clarity and viscosity

D. To decrease the cloudiness and increase the nutritional value

7. What is the direct use of light energy in photosynthesis?

I. To split water

II. To produce ATP

III. To fix CO_2

A. I and II only

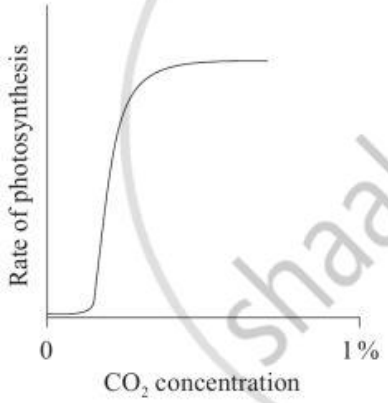
B. I and III only

C. II and III only

D. I, II and III

8. Which graph shows the effect of increasing carbon dioxide concentration (CO_2) on the rate of photosynthesis?

A.



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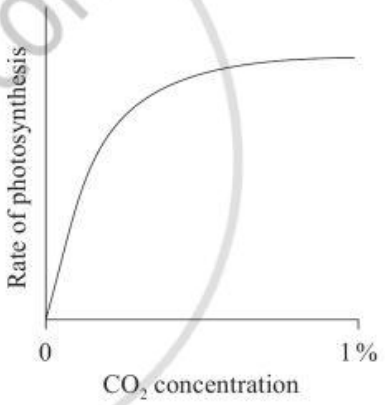

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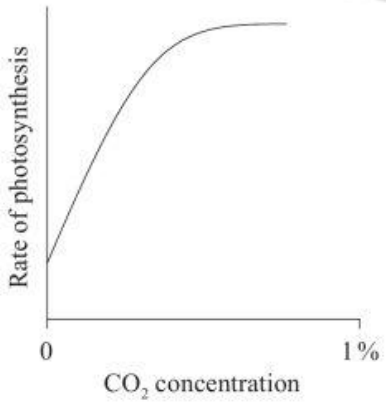

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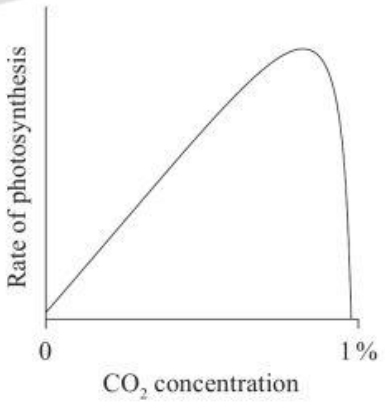


9. What are the components of a eukaryotic chromosome?

A. One DNA molecule and one large protein

B. Many DNA molecules and many proteins

C. One DNA molecule and many proteins

D. Many DNA molecules and one large protein

10. How does the X chromosome differ from the Y chromosome in humans?

A. The Y chromosome is longer.

B. Some genes on the X chromosome are absent from the Y chromosome.

C. The genes are the same but some on the Y chromosome are not expressed.

D. The X chromosome determines sex.

11. What are the functions of the polymerase chain reaction?

I. Copy fragments of DNA

II. Amplify fragments of DNA

III. Translate fragments of DNA

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

12. What is the cause of sickle cell anemia?

A. Errors in the translation of mRNA

B. A base substitution mutation in DNA

C. A transcription error that replaces A with U

D. A mutation that leads to glutamic acid instead of valine

13. What is the initial energy source for all terrestrial communities?

A. Water

B. Photosynthesis

C. Light

D. Glucose

14. Which factors can cause a decrease in a population?

	Emigration	Natality	Immigration	Mortality
A.	Low	High	Low	High
B.	High	Low	High	Low
C.	High	Low	Low	High
D.	Low	High	High	Low

15. 10 000 melons were collected from plants in the same area. Assuming their sizes are normally distributed, how many melons would you expect to be within two standard deviations from the mean?

A. 3400

B. 5000

C. 6800

D. 9500

16. Which statement about the greenhouse effect is true?

A. It is a recent phenomenon that started about fifty years ago.

B. It is a natural phenomenon caused by several gases.

C. It is a natural phenomenon caused by carbon dioxide.

D. Human activities are the only cause of the effect.

17. Why is most food digested?

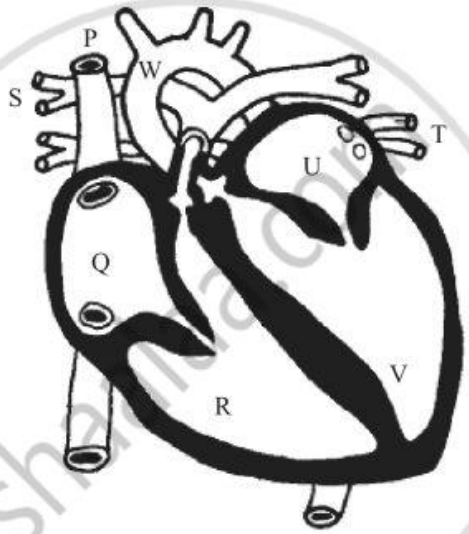
A. Digestive enzymes require a variety of substrates.

B. It ensures that the diet is balanced.

C. Most ingested food molecules are large.

D. To prevent disorders of the intestine.

18. The diagram below shows the human heart. Which parts contain the most oxygenated blood?



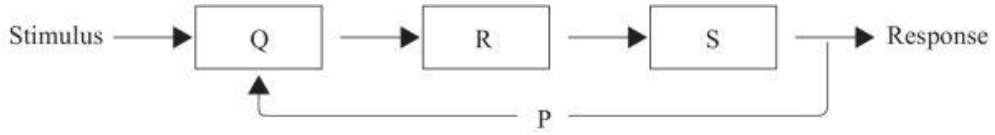
A. P and T

B. Q, R and S

C. T, U, V and W

D. T, U, R and S

19. The diagram below illustrates the main features of homeostasis.



What are P, Q, R and S?

	P	Q	R	S
A.	Feedback	Receptor/detector	Controller/integrator	Effector
B.	Receptor/detector	Controller/integrator	Feedback	Effector
C.	Feedback	Receptor/detector	Effector	Controller/integrator
D.	Effector	Receptor/detector	Feedback	Controller/integrator

20. What are responsible for the lowering of blood glucose levels?

I. β-cells in the pancreas
II. Insulin molecules
III. α-cells in the pancreas

A. II only
B. I and II only
C II and III only
D I, II and III

21. What is the function of DNA polymerase I?

A. To add appropriate nucleotides in the $3' \rightarrow 5'$ direction
B. To remove the RNA primers and replace them with DNA
C. To join together the Okazaki fragments
D. To join together both strands of DNA to the histones

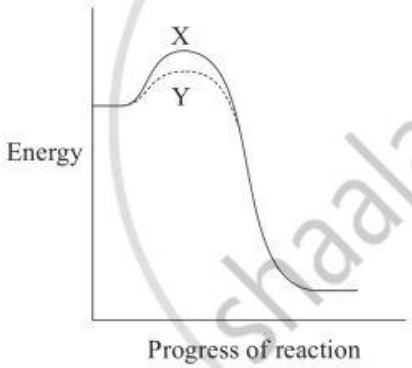
22. Which statement describes how allosteric enzymes work?

	Reversible	Competitive inhibition	End-product inhibition	Active and inactive forms
A.	×	×	✓	✓
B.	✓	×	✓	✓
C.	✓	✓	×	✓
D.	×	✓	×	×

Key: ✓ = yes × = no

23. Which diagram shows how enzymes change the activation energy in an **endergonic** reaction?

A.



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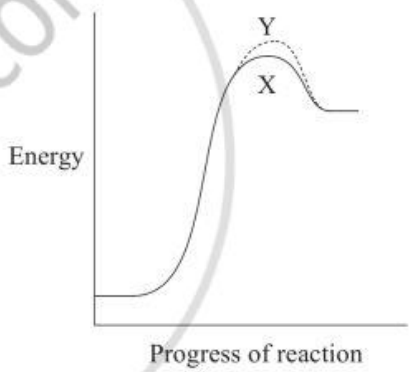

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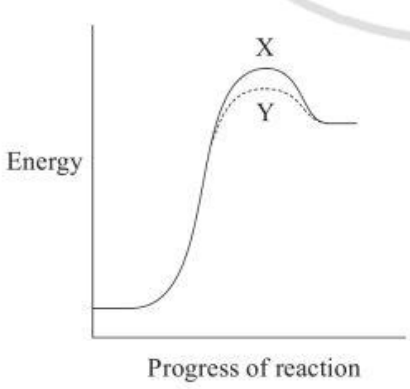

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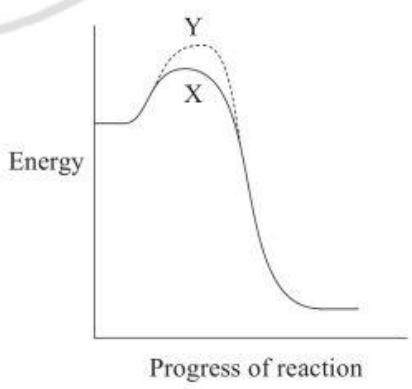


Key: X = without enzyme Y = with enzyme

24. What is the "link reaction" in eukaryotic respiration?

A. Pyruvate joining with coenzyme A to produce CO_2 and $NADH + H^+$

B. Oxidation of NADH to yield electrons and protons

C. Acetyl coenzyme A combining or joining with a C_4 compound to give C_6 + coenzyme A

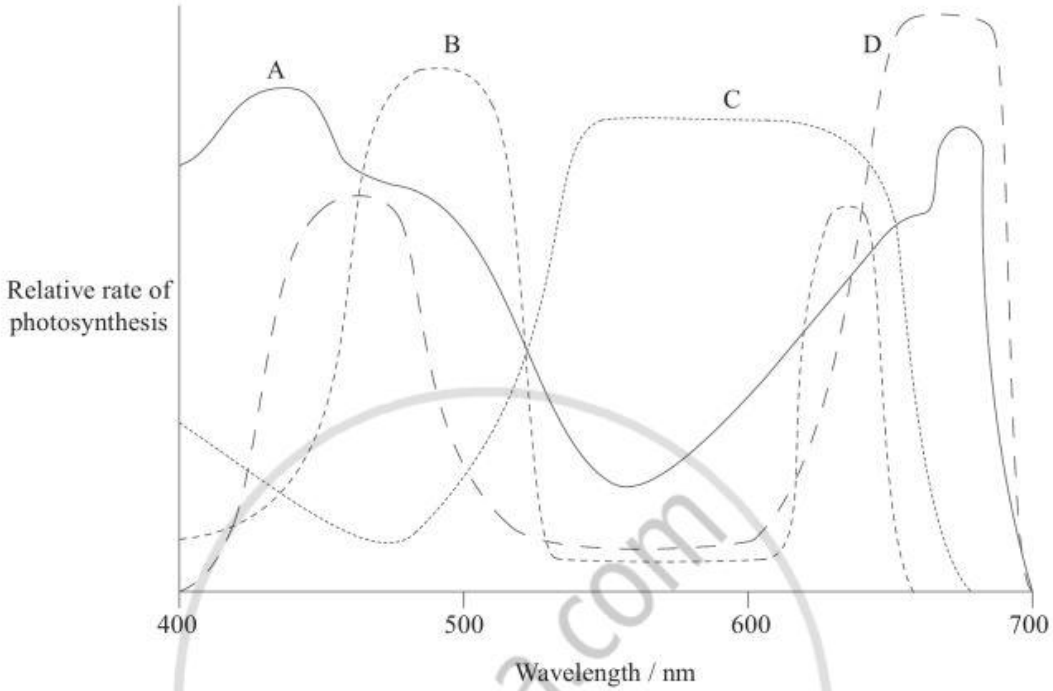
D. Passage of acetyl coenzyme A through the mitochondrial membrane

25. How are photosynthesis and aerobic respiration similar?

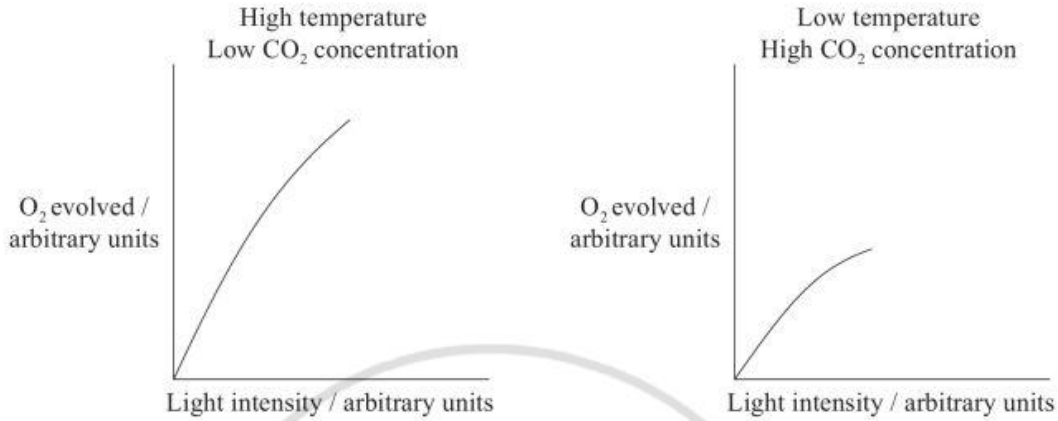
	ATP synthetase enzyme	Electron transport chain	$NADH + H^+$
A.	✓	×	×
B.	×	×	✓
C.	✓	✓	✓
D.	✓	✓	×

Key: ✓ = both have or use this × = both do not have or use this

26. In the graph below which line shows an action spectrum of photosynthesis?



27. Students investigated the rate of photosynthesis by measuring the rate of oxygen evolved from an aquatic plant. The results of the two experiments they set up are shown below.



Which conclusion can be drawn only from this data?

A. Temperature does not affect the rate of photosynthesis.

B. High concentrations of CO_2 reduce the rate of photosynthesis.

C. Temperature and CO_2 concentration are both limiting factors.

D. The greater the light intensity the greater the rate of photosynthesis.

28. How does recombination normally occur for unlinked genes?

A. Crossing-over in Prophase I

B. Random chromosome assortment

C. Failure of spindles to form

D. Random gene mutations

29. In the Sailfin Molly fish, gold colour (g) is recessive to normal colour (G). When a gold coloured fish was crossed with a normal colour fish, 55 of the offspring were normal colour and 45 were gold colour.

One hypothesis is that the normal parent was heterozygous. The Chi-squared value is 1. The table below shows the probability values.

	Probability			
Degrees of freedom	0.99	0.950	0.05	0.01
1	0.000	0.004	3.84	6.64
2	0.020	0.103	5.99	9.21
3	0.115	0.352	7.82	11.35

Which of the following is the correct response?

A. Accept the hypothesis because the Chi-squared value is less than 3.84.

B. Reject the hypothesis because the probability is less than 0.05.

C. Accept the hypothesis because the Chi-squared value is less than 5.99.

D. Reject the hypothesis because there is not enough evidence.

30. Why is it sometimes difficult to identify how certain characteristics are inherited in humans.

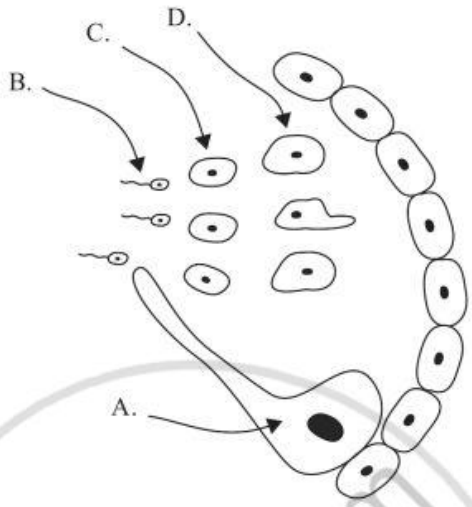
A. Most genes are linked.

B. Rates of mutation are high.

C. The inheritance may be polygenic.

D. The environment varies so little.

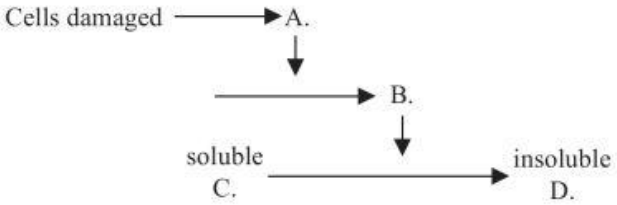
31. The diagram below represents a cross section of a seminiferous tubule. Which label is pointing to a primary spermatocyte?



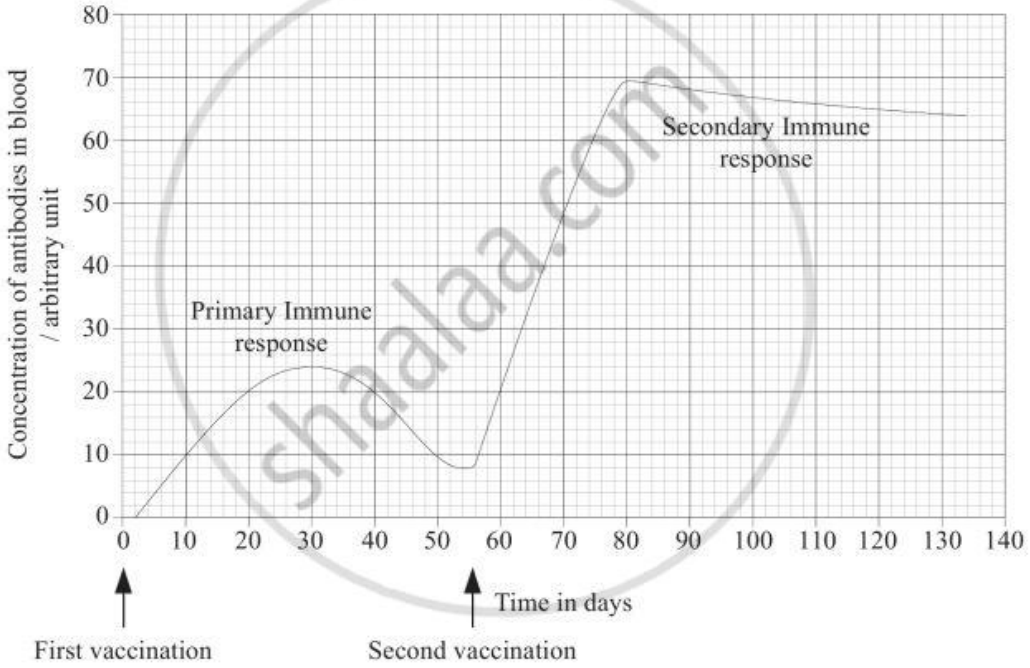
32. What is the order of the processes in fertilization?

A.	Softening of ovum membrane	→	Penetration by sperm	→	Sperm acrosome reaction	→	Cortical reaction by ovum
B.	Sperm acrosome reaction	→	Cortical reaction by ovum	→	Softening of ovum membrane	→	Penetration by sperm
C.	Penetration by sperm	→	Cortical reaction by ovum	→	Sperm acrosome reaction	→	Softening of ovum membrane
D.	Sperm acrosome reaction	→	Softening of ovum membrane	→	Penetration by sperm	→	Cortical reaction by ovum

33. The diagram below represents a simplification of the clotting process. Which letter represents thrombin?



34. The graph below shows the primary and secondary responses when a person is exposed to a particular antigen.



When does the rapid multiplication of lymphocytes to produce a clone of identical plasma cells take place?

A. 0 – 30 days

B. 30 – 55 days

C. 55 – 80 days

D. +80 days

35. Which process triggers the uptake of Ca^{2+} ions in synaptic transmission?

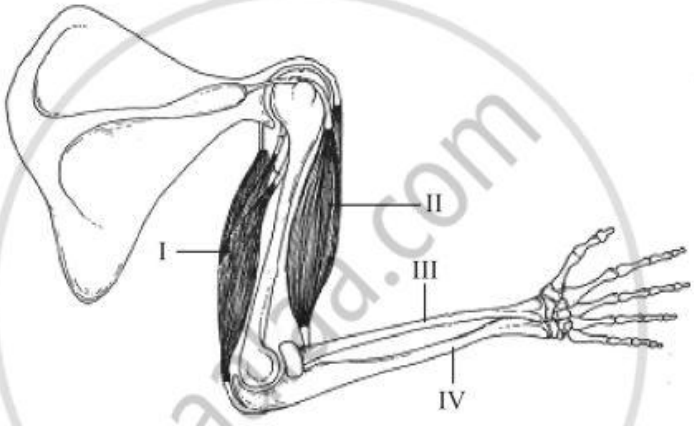
A. The influx of Na^{+} ions only

B. The release of the neurotransmitter

C. The depolarisation of the post-synaptic membrane

D. The arrival of the nerve impulse in the pre-synaptic neuron

36. The diagram below shows the muscles and bones of the human upper arm.



Which answer has them labelled correctly?

	Biceps	Triceps	Ulna	Radius
A.	I	II	IV	III
B.	II	I	IV	III
C.	I	II	III	IV
D.	II	I	III	IV

37. Why do birds produce nitrogen waste as uric acid?

A. It requires less energy to make compared with urea.

B. It requires very little water in order to excrete.

C. Birds have very few excess amino acids.

D. It can be excreted while flying.

38. In which part of the kidney is most glucose reabsorbed from the glomerular filtrate?

A. Glomerulus

B. Proximal convoluted tubule

C. Loop of Henle

D. Distal convoluted tubule

39. Why are there usually more palisade mesophyll cells on the upper surface of the leaf than on the lower surface?

A. Less water is lost.

B. More light is trapped.

C. It makes the leaf stronger.

D. They are closer to the veins.

40. What is the usual order of events in the germination of a typical starchy seed?

	Gibberellin released	Water absorbed	Amylase produced	Starch digested
A.	1	2	3	4
B.	4	1	2	3
C.	2	1	3	4
D.	3	4	1	2

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MARKSCHEME

November 2006

BIOLOGY

Higher Level

Paper 1

2 pages

1.	C	16.	B	31.	D	46.	–
2.	B	17.	C	32.	D	47.	–
3.	C	18.	C	33.	B	48.	–
4.	C	19.	A	34.	A/C	49.	–
5.	B	20.	B	35.	D	50.	–
6.	A	21.	B	36.	B	51.	–
7.	A	22.	B	37.	B	52.	–
8.	B	23.	C	38.	B	53.	–
9.	C	24.	A	39.	B	54.	–
10.	B	25.	D	40.	C	55.	–
11.	A	26.	A	41.	–	56.	–
12.	B	27.	D	42.	–	57.	–
13.	C	28.	B	43.	–	58.	–
14.	C	29.	A	44.	–	59.	–
15.	D	30.	C	45.	–	60.	–