



EXAM PAPERS PRACTICE

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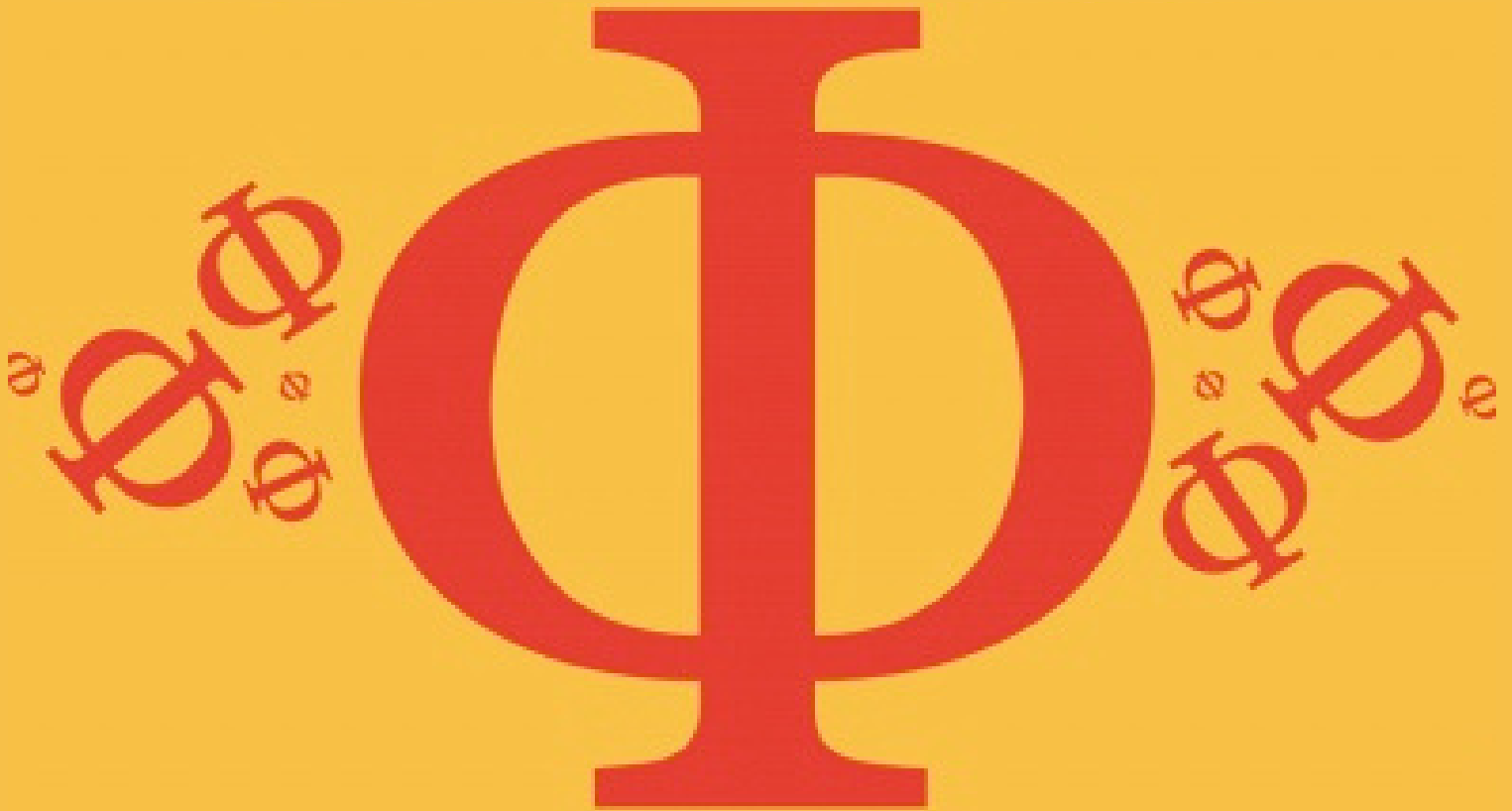
Detailed mark scheme

Suitable for all boards

Designed to test your ability and

Set A

Practice Paper 1



BIOLOGY

IB HL

Practice Paper 1

Question Paper

Course	DP IB Biology
Section	Set A
Topic	Practice Paper 1
Difficulty	Medium

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Time allowed: 40
Score: /30
Percentage: /100

Question 1

The list below contains structures that are all features of eukaryotic cells.

- I. Nucleus
- II. Endoplasmic reticulum
- III. Lysosome
- IV. Chloroplast
- V. Mitochondrion

Which of these structures will have a double membrane?

- A** I, II and III
- B** I, III and IV
- C** I, IV and V
- D** II, III and IV

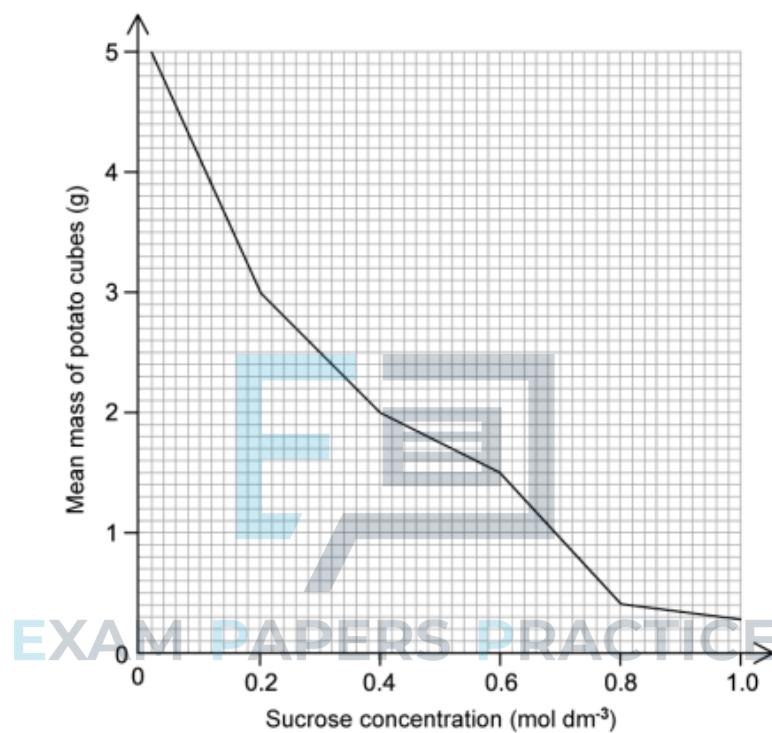


Question 2

An experiment to calculate the osmolarity of potato was performed using the following protocol:

1. Dice potato into 1cm^3 cubes.
2. Add potato cubes to 6 test tubes, each containing solution with a different sucrose concentration.
3. Wait 12 hours.
4. Weigh the cubes from each test tube and plot a graph.

The mean mass of the potato cubes was 2.50g before being added to solution and the graph shows the masses of potato cubes after the experiment.



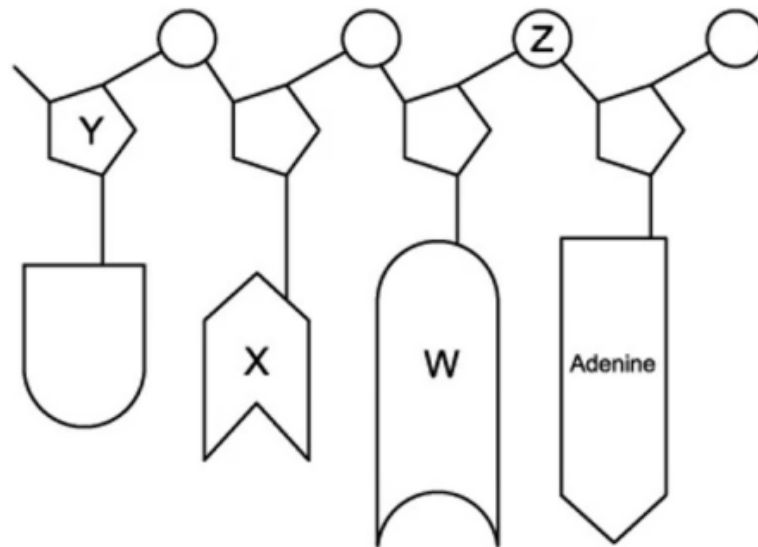
What concentration of sucrose has the same osmolarity as the potato?

- A. 0.00 mol dm^{-3}
- B. 0.12 mol dm^{-3}
- C. 0.31 mol dm^{-3}
- D. 0.66 mol dm^{-3}

[1 mark]

Question 3

The diagram shows part of an RNA molecule.



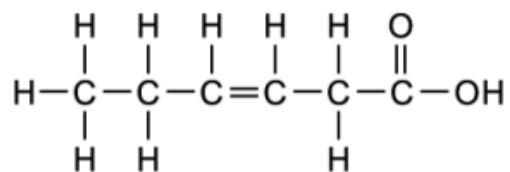
Which row of the table below is correct?

	Uracil	Phosphate	Ribose	Guanine
A	W	Z	Y	X
B	W	Y	Z	X
C	X	Z	Y	W
D	X	Y	Z	W

[1 mark]

Question 4

The diagram below shows a component of a triglyceride.



Which of the following correctly identifies this component?

- A. Saturated fatty acid
- B. Monounsaturated fatty acid
- C. Polyunsaturated fatty acid
- D. Phospholipid

[1 mark]

Question 5

Which of the following ideas are part of cell theory?

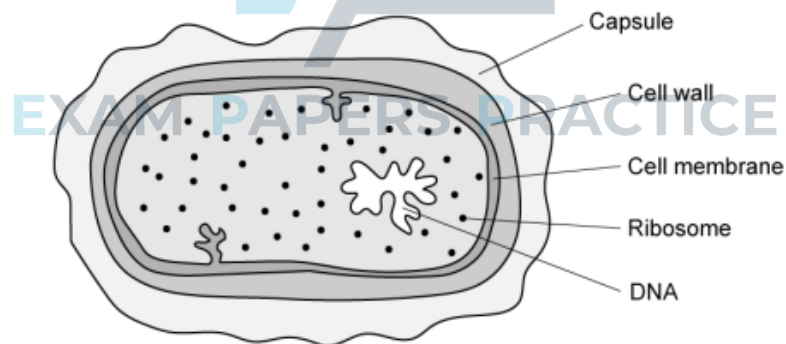
- I. Cells are the smallest unit of life.
- II. Cells show great variety in shape and structure.
- III. Cells are derived from other cells (pre-existing cells) by division.

- A I only
- B II only
- C I and III only
- D II and III only

[1 mark]

Question 6

The diagram shows a type of prokaryotic cell, a bacterium.



Which three structures are found in **both** an animal cell and this bacterium cell?

- A. cell membrane, cell wall and DNA
- B. cell membrane, DNA and ribosome
- C. capsule, DNA and ribosome
- D. capsule, cell membrane and cell wall

[1 mark]

Question 7

The sentence below describes a cellular process and an associated eukaryotic cellular structure.

Cells which have a high rate of ...I... will have many ...II... .

Select the terms that best fit the gaps in this sentence.

	I	II
A	Facilitated diffusion	Mitochondria
B	DNA replication	Lysosomes
C	Exocytosis	Vesicles
D	Phospholipid production	Ribosomes

[1 mark]

Question 8

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Which of the following sequences of atomic symbols best represents the makeup of the elements in the human body, **in descending order**, by mass?

- A O, C, H, N, S, P
- B C, H, O, N, S, P
- C O, C, N, H, Na, K
- D C, H, O, N, K, S

[1 mark]

Question 9

Trypsin is a digestive enzyme found in pancreatic juices that breaks down proteins into polypeptides in the small intestine. The image below represents the three dimensional structure of trypsin.

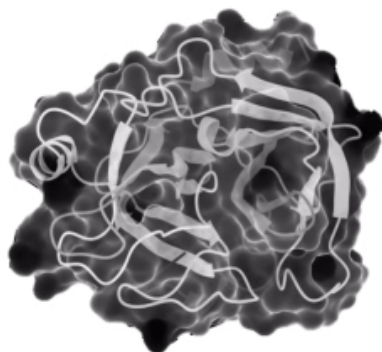


Image courtesy of Ofb1d8. Licensed under Creative Commons Attribution-Share Alike 4.0 International license. Reused and distributed under conditions found at: <https://creativecommons.org/licenses/by-sa/4.0/deed.en>

Which of the following would be the most accurate description of the conformation of trypsin?

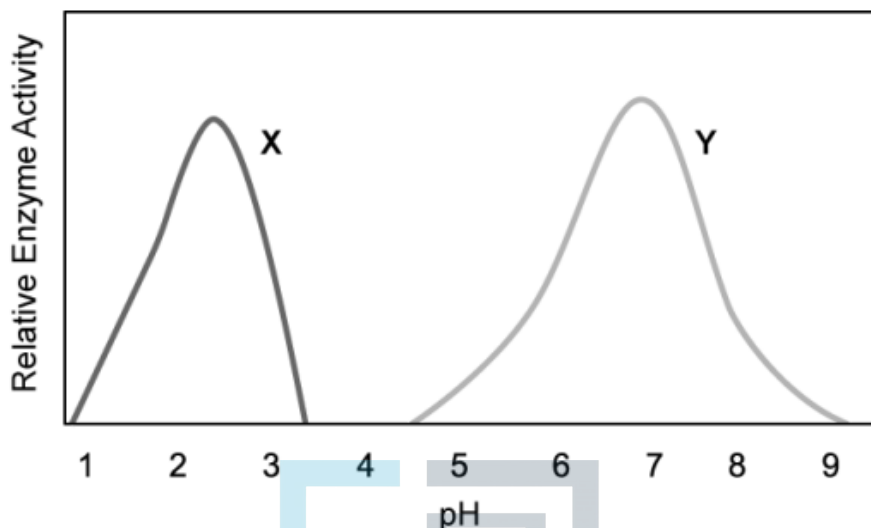
- A. It is a functional protein that is folded into a specific shape which is held in position by bonds between the R-groups of neighbouring amino acids, with hydrophilic R-groups facing towards the outside of the molecule
- B. It is a functional protein that is folded into a specific shape which is held in position by bonds between the R-groups of neighbouring amino acids, with hydrophobic R-groups facing towards the outside of the molecule
- C. It is a structural protein that is folded into a specific shape which is held in position by bonds between the R-groups of repeating amino acids
- D. It is a functional protein that is folded into a specific shape which is held in position by bonds between the R-groups of neighbouring amino acids, with hydrophilic R-groups facing towards the inside of the molecule

[1 mark]

Question 10

Scientists extracted enzymes from different parts of the digestive tract of a mammal. The containers of enzyme samples got mixed up with each other before the scientists could label them. In order to identify the enzymes, they monitored the enzyme activity of each sample at different pH levels to determine the optimum pH for each.

The graph below shows the results for two of the samples (X and Y).



Which of the following would be the most valid conclusion that the scientists can draw from these results?

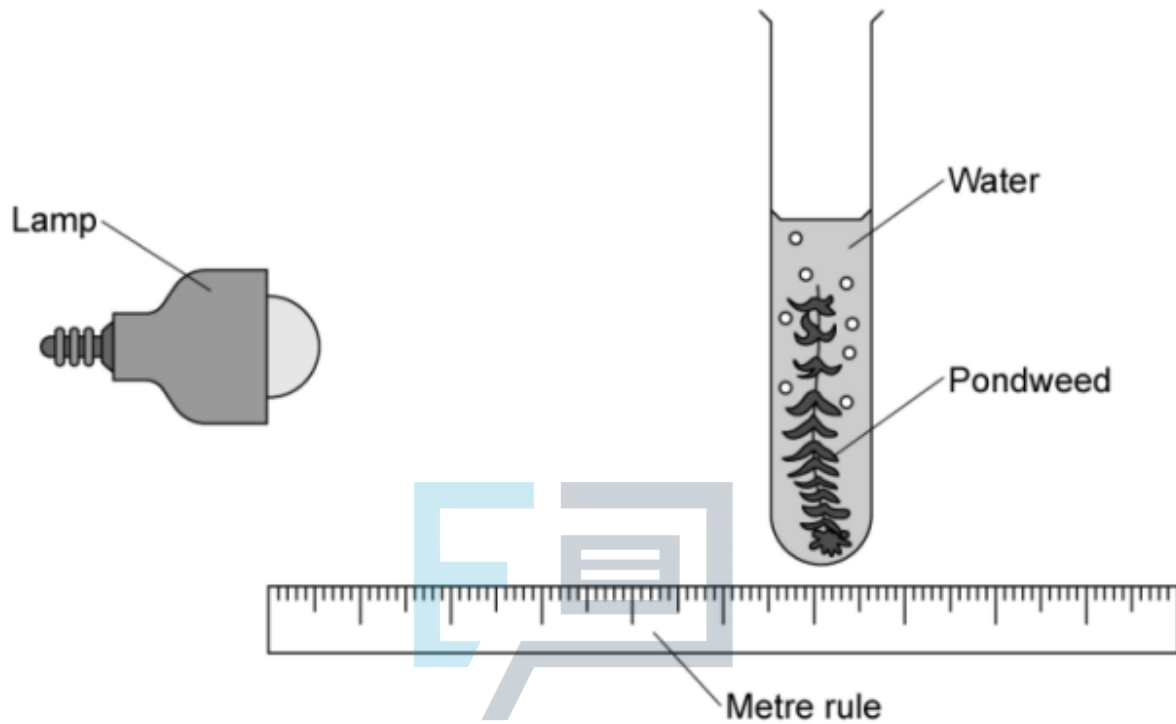
- A. Enzyme X is from the stomach of the mammal since it performs at an optimum when conditions are acidic, while enzyme Y is most likely from the mouth of the mammal where conditions are more neutral
- B. Enzyme X is from the stomach of the mammal since it performs at an optimum when conditions are acidic, while enzyme Y is most likely from the small intestine of the mammal where conditions are more alkaline
- C. Enzyme Y is from the stomach of the mammal since it performs at an optimum when conditions are acidic, while enzyme X is most likely from the small intestine of the mammal where conditions are more alkaline
- D. Enzyme Y is from the mouth of the mammal since it performs at an optimum when conditions are neutral, while enzyme X is most likely from the small intestine of the mammal where conditions are more alkaline

[1 mark]



Question 11

A student designed the following experimental set-up to measure the effect of light intensity on the rate of photosynthesis. The experiment was repeated three times.



Distance from lamp (cm)	Number of bubbles per minute		
	Replicate 1	Replicate 2	Replicate 3
10	99	81	64
20	63	43	45
30	31	18	13
40	18	7	8
50	15	6	4

The results were inconsistent, how could the experimental set-up be improved?

- A** Measuring the change in biomass of the plant.
- B** Using cooled, boiled water to remove dissolved oxygen.



- C** Replacing the water with sodium hydrogen carbonate solution.
- D** Using a red light source.

[1 mark]

Question 12

Two parents with normal factor VIII have a child with haemophilia.

Which is the correct statement?

- A. The mother is normal but the father carries the defective gene.
- B. Both parents are carriers for the defective gene.
- C. Only the mother is a carrier for the defective gene.
- D. The child must have been female.

[1 mark]

Question 13

How did Gregor Mendel ensure the reliability of his data?

- A** Repeating his investigation many times.
- B** Collecting large amounts of qualitative data.
- C** Making observations of a pea plant over many years.
- D** Completing a statistical test on his results.

[1 mark]



Question 14

Five events that take place during meiosis are listed.

Which is the correct chronological order (1 – 5) of those events?

A.

1.	crossing over
2.	haploid gametes form
3.	formation of bivalents
4.	reduction division
5.	replication of DNA

B.

1.	haploid gametes form
2.	reduction division
3.	formation of bivalents
4.	crossing over
5.	replication of DNA

C.

1.	replication of DNA
2.	formation of bivalents
3.	crossing over
4.	haploid gametes
5.	form reduction division

D.

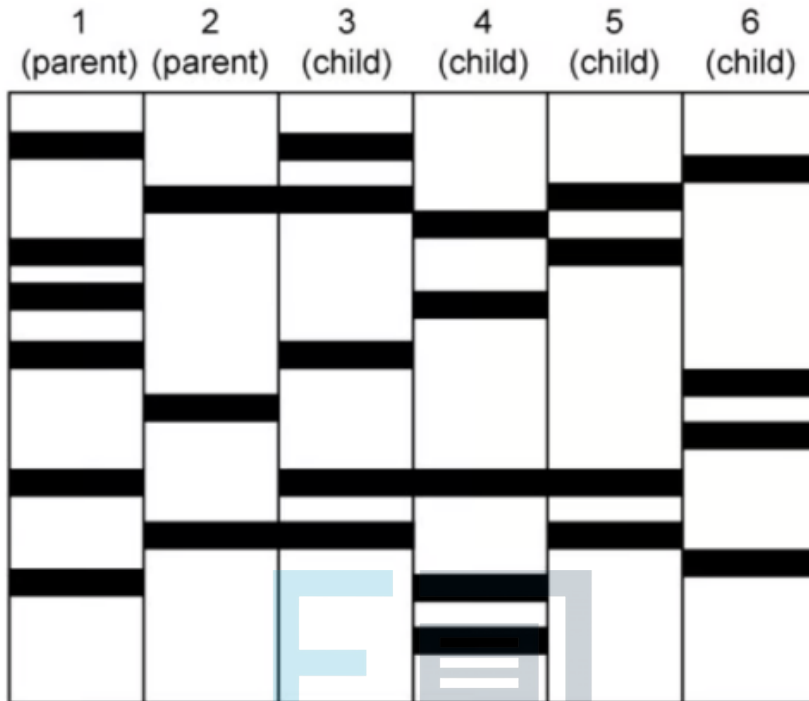
1.	replication of DNA
2.	formation of bivalents
3.	crossing over
4.	reduction division
5.	haploid gametes form

[1 mark]



Question 15

Which statement can **not** be concluded from the DNA profile shown?



- A Parent 1 and parent 2 are profiles of unrelated individuals.
- B Children 3 and 5 are non-identical twins.
- C Child 4 is related to parent 1 but not parent 2.
- D Child 6 is unrelated to any of the other individuals.

[1 mark]

**Question 16**

A possible research question on plant cloning could be:

'Does the position on the stem at which a cutting is taken affect its ability to form roots?'

Which variables would allow a valid investigation into this question?

	Independent variable	Dependent variable	A control variable
A	The mass of roots formed	Whether the cutting is taken from above or below the node	Use the same species of plant in each repeat
B	Whether the cutting is taken from above or below the node	The mass of leaves formed	Provide the same volume of water for each plant
C	Different lengths of the cutting	The mass of roots formed	Provide the same volume of water for each plant
D	Whether the cutting is taken from above or below the node	The mass of roots formed	Use the same species of plant in each repeat

[1 mark]

Question 17

Which row of the table correctly identifies an observation of food chains and the theory used to explain that observation?

	Observation	Theory
I	Food chains are short	Energy losses occur at each trophic level
II	Food chains have a pyramid structure	Organisms with a larger biomass provide more energy to the next trophic level
III	Food chains all start with a producer	Producers transfer energy most efficiently
IV	Energy losses occur at each trophic level	Energy is transferred to the surroundings during respiration

- A. I only
- B. I and IV
- C. II and IV
- D. I and III

[1 mark]



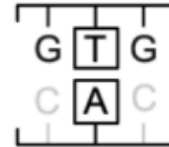
Question 18

Sickle cell anaemia is caused by the following mutation in the gene that codes for haemoglobin:

Normal haemoglobin gene



Mutated haemoglobin gene



Which of the following correctly explains how this mutation causes sickle cell anaemia?

- A** It causes valine to be replaced by glutamic acid, altering the structure of the haemoglobin protein.
- B** It produces an allele known as Hb^A.
- C** It causes glutamic acid to be replaced by valine, altering the structure of the final haemoglobin protein.
- D** It causes an amino acid substitution at the 8th position in the polypeptide.

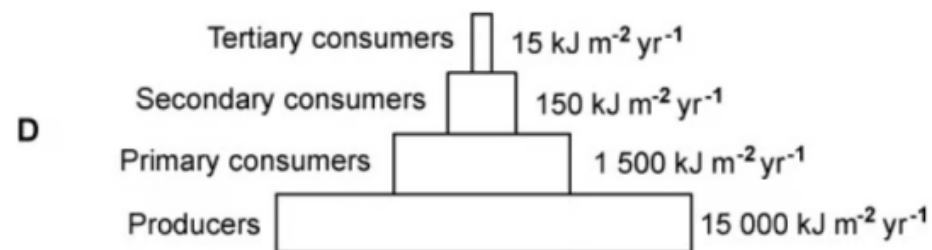
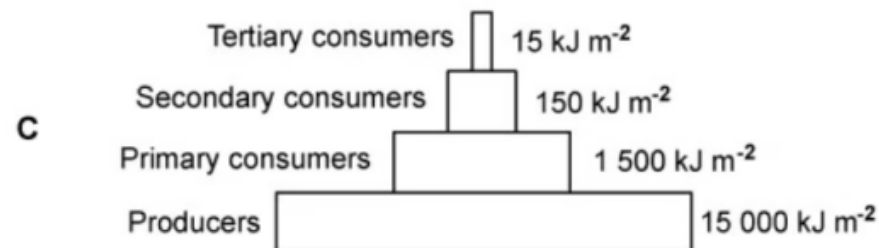
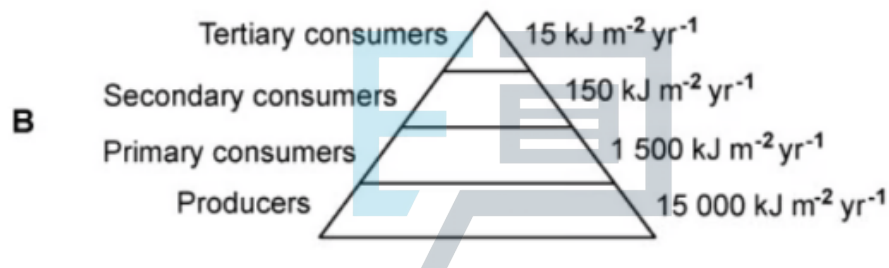
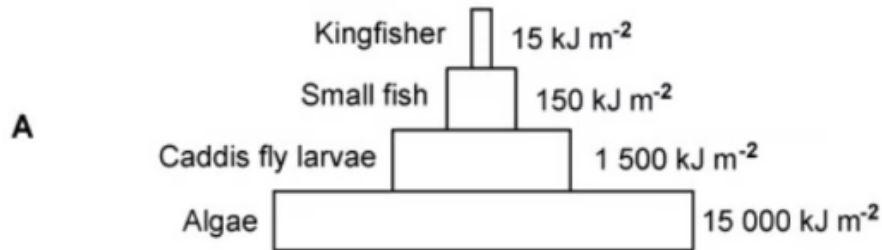
[1 mark]



Question 19

Which pyramid of energy correctly represents the food chain shown?

Algae → caddis fly larvae → small fish → kingfisher



[1 mark]

Question 20

Which of the following statements about the removal of carbon from the atmosphere are correct?

- I. Atmospheric carbon is converted into carbohydrates during photosynthesis.
- II. Carbon enters the cells of aquatic plants by diffusing directly from the surrounding water.
- III. Carbon combines with water to form carbonic acid, which dissociates to form hydrogen carbonate ions, raising the pH of water.

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



[1 mark]

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Question 21

Which of the following is **not** true about mesocosms?

- A. Mesocosms allow the control of environmental conditions
- B. Mesocosms allow collection of reliable data
- C. Continuous data can be collected from a mesocosm
- D. It is easy to mimic natural environmental conditions in a mesocosm

[1 mark]

Question 22

Which of the following processes generate genetic variation?

- I. Random orientation
- II. Mitosis
- III. DNA replication
- IV. Random fertilisation

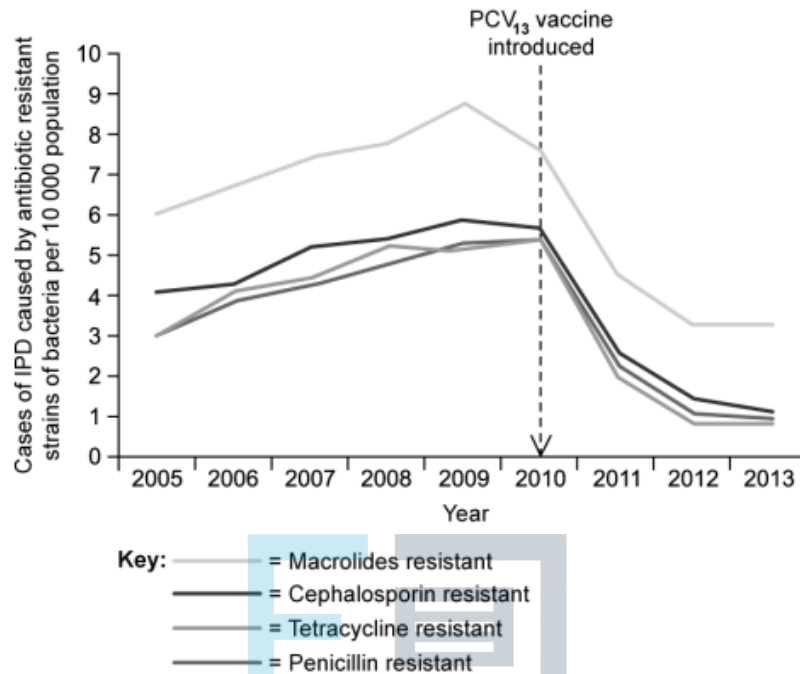
- A** I and III only
- B** I and IV only
- C** I, III, and IV only
- D** I, II, III, and IV

[1 mark]



Question 23

The pneumococcal conjugate vaccine (PCV13) provides protection against infection caused by the bacterium *Streptococcus pneumoniae*. The graph shows the number of cases of invasive pneumococcal disease (IPD) caused by antibiotic resistant *S. pneumoniae* before and after the introduction of PCV13.



Which statement correctly explains the number of cases of IPD caused by antibiotic resistant *S. pneumoniae* after the introduction of PCV13?

- A. The vaccine is killing the bacteria that cause the infections.
- B. The vaccine has reduced the use of antibiotics, meaning that resistance alleles are no longer advantageous.
- C. The vaccine has reduced the use of antibiotics and the bacteria respond by becoming less resistant.
- D. The vaccine has reduced the use of antibiotics, preventing resistance alleles from being passed on when bacteria divide.



Question 24

Which of the following parts of the digestive system produce and secrete protein-digesting enzymes into the alimentary canal?

	Stomach	Pancreas	Small intestine
A	Yes	No	Yes
B	No	Yes	Yes
C	Yes	Yes	No
D	Yes	Yes	Yes

[1 mark]

Question 25

Some scientists were investigating mitosis in plant cells. They applied a chemical agent called colchicine, which interferes with tubulin proteins in the cytoplasm. An image of some chromosomes from a treated cell can be seen below.



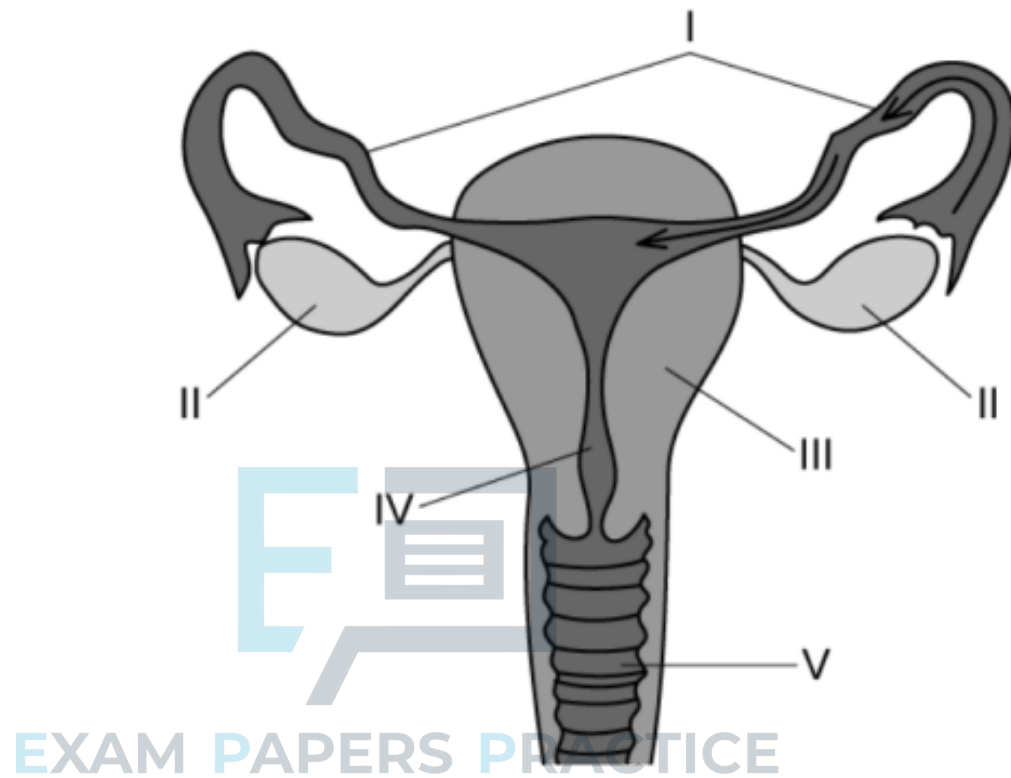
How does treatment with colchicine prevent progression of cell division in plant cells?

- A. Treatment with colchicine prevents cells moving past interphase as chromosomes are decondensed
- B. Treatment with colchicine prevents cells moving into prophase as spindle fibres have not formed
- C. Treatment with colchicine prevents cells moving into anaphase as spindle fibres have not formed
- D. Treatment with colchicine prevents cells moving past metaphase as chromosomes are decondensed

[1 mark]

Question 26

The diagram shows the female reproductive system.



Which row correctly identifies the structures?

	I	II	III	IV	V
A	Oviduct	Ovary	Uterus	Vagina	Cervix
B	Ovary	Oviduct	Uterus	Vagina	Cervix
C	Oviduct	Ovary	Uterus	Cervix	Vagina
D	Oviduct	Ovary	Cervix	Uterus	Vagina

[1 mark]

Question 27

Which was a feature of Galen's theory of blood flow prior to his theory being superseded by that of William Harvey?

- A. Blood flows in a closed loop
- B. Blood is constantly re-used throughout a day
- C. The heart is a pump
- D. Blood flow is bidirectional

[1 mark]

Question 28

Which set of conditions is required to allow the intake of air into the lungs during ventilation?

- A** Contracted diaphragm, increased volume and increased pressure inside the thorax.
- B** Relaxed diaphragm, increased volume and decreased pressure inside the thorax.
- C** Relaxed diaphragm, decreased volume and increased pressure inside the thorax.
- D** Contracted diaphragm, increased volume and decreased pressure inside the thorax.

Question 29

Which of the following are roles of thyroxine?

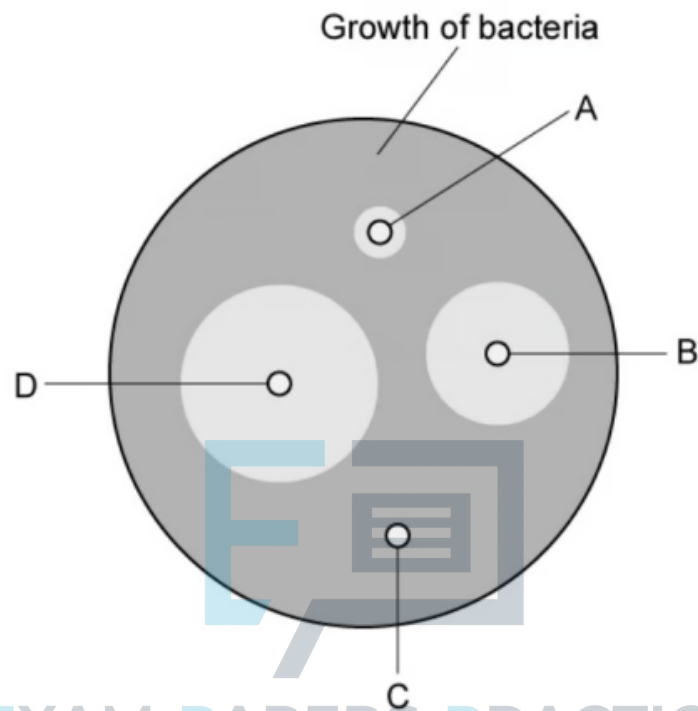
- I. Targets metabolically active regions, such as adipose tissue.
 - II. Increase the rate of protein synthesis.
 - III. Inhibits the appetite and reduces food intake.
 - IV. Increase the generation of body heat.
-
- A II only
 - B I and II only
 - C II and IV only
 - D I, II, III and IV

[1 mark]

Question 30

An antibiotic sensitivity test was performed on bacteria isolated from a patient's throat.

The diagram shows the results of the four antibiotics tested.



Which one should be used to treat the disease?

[1 mark]