

## **A Level Biology B**

**H422/01** Fundamentals of biology

### **Question Set 24**

Module 4 Energy, reproduction and populations

Multiple Choice Questions

1 Which of the options, **A** to **D**, is the net gain in ATP molecules following the glycolysis of **one** glucose molecule?

**A** 1

**B** 2

**C** 4

**D** 6

Your answer

[1]

2 Oxidative phosphorylation is the process in which the transfer of electrons from reduced NAD or reduced FAD to oxygen results in the production of ATP.

Which of the options, **A** to **D**, is the number of ATP molecules gained from the oxidation of **two** molecules of reduced NAD?

**A** 2

**B** 3

**C** 4

**D** 5

Your answer

[1]

3 Which of the options, **A** to **D**, correctly identifies the products of anaerobic respiration in yeast?

**A** CO<sub>2</sub>, NAD, ATP and ethanol

**B** CO<sub>2</sub>, NAD, ADP and lactic acid

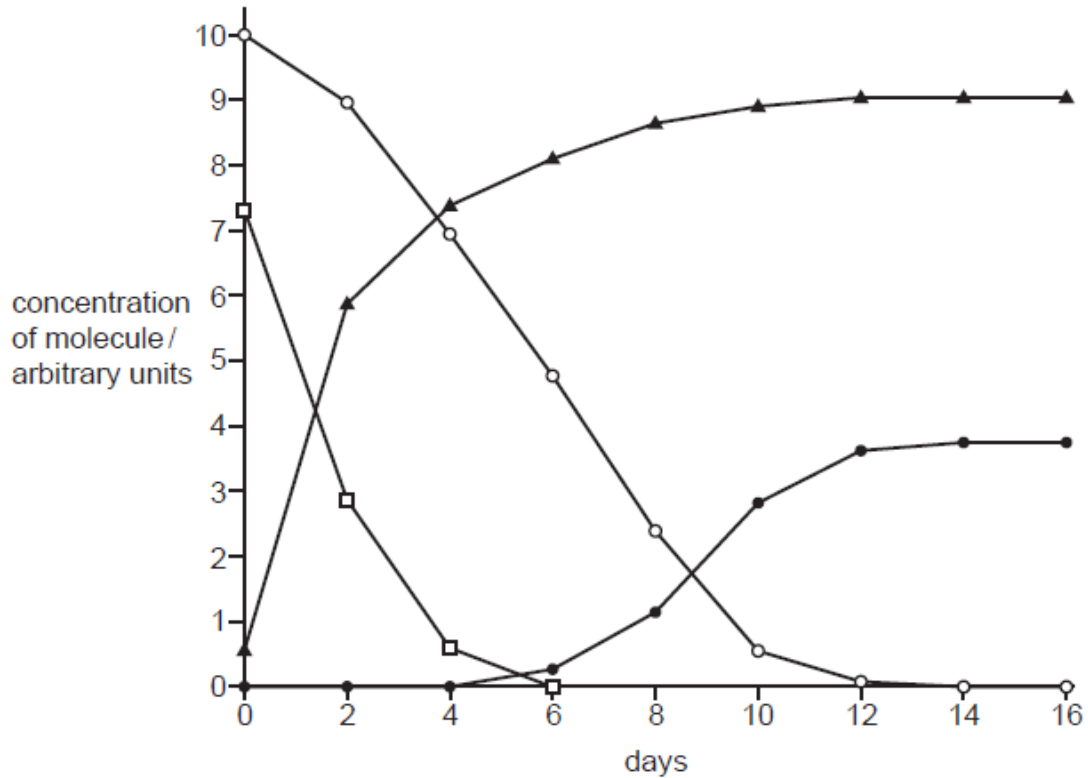
**C** CO<sub>2</sub>, reduced NAD, ATP and ethanol

**D** CO<sub>2</sub>, reduced NAD, ADP and lactic acid

Your answer

[1]

- 4 The graph below shows the concentration of several molecules over time in the medium of a cell culture.



**Key**

- oxygen
- ▲ carbon dioxide
- glucose
- product X

Which of the following statements is/are correct?

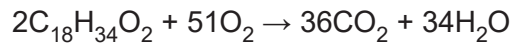
- 1 The culture comprises mammalian cells, **not** yeast cells.
- 2 The graph shows evidence of aerobic and anaerobic respiration.
- 3 Product X is generated in the cell cytoplasm.

- A 1, 2 and 3 are correct
- B only 1 and 2 are correct
- C only 2 and 3 are correct
- D only 1 is correct

Your answer

[1]

5 The balanced equation for the aerobic respiration of a substrate is given below.



Which of the statements, **A** to **D**, gives the correct respiratory quotient (RQ) and identity of this substrate?

- A** RQ = 0.68, and the substrate is a carbohydrate
- B** RQ = 0.71, and the substrate is a fatty acid
- C** RQ = 0.76, and the substrate is a carbohydrate
- D** RQ = 1.00, and the substrate is a fatty acid

Your answer

[1]

6 Which of the options, **A** to **D**, causes an increase in stroke volume following regular exercise?

- A** atrial hypertrophy
- B** decrease in blood pressure
- C** increase in heart rate
- D** ventricular hypertrophy

Your answer

[1]

7 Which of the options, **A** to **D**, is the long-term effect of aerobic training on VO<sub>2</sub> max and excess post-exercise oxygen consumption (EPOC)?

- A** decreased VO<sub>2</sub> max and decreased EPOC
- B** decreased VO<sub>2</sub> max and increased EPOC
- C** increased VO<sub>2</sub> max and decreased EPOC
- D** increased VO<sub>2</sub> max and increased EPOC

Your answer

[1]

8 Some chemicals bind directly to haemoglobin.

Which of the options, **A** to **D**, correctly identifies two of these chemicals?

- A  $\text{CO}_2$  and  $\text{H}^+$
- B  $\text{H}^+$  and  $\text{HCO}_3^-$
- C  $\text{HCO}_3^-$  and  $\text{CO}_2$
- D  $\text{H}_2\text{CO}_3$  and  $\text{H}^+$

Your answer

[1]

9 ATP is required for the contraction of skeletal muscle.

Which of the options, **A** to **D**, is the result of ATP binding to the myosin head?

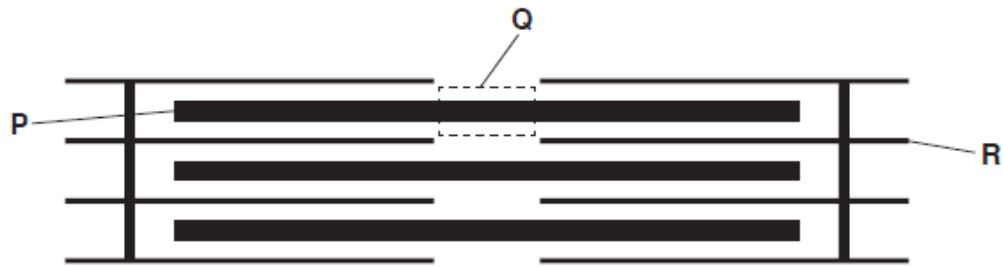
- A attachment of the myosin head to actin
- B detachment of the myosin head from actin
- C return of the myosin head to the original (cocked) position
- D tilting of the myosin head

Your answer

[1]

10 The diagram below represents the ultrastructure of a single sarcomere in skeletal muscle.

Three features of the sarcomere are labelled **P**, **Q** and **R**.



Here are three statements about the diagram:

- 1 During muscle contraction, **R** slides along **P**.
- 2 **P** is responsive to calcium ions.
- 3 **Q** is responsive to ATP molecules.

Which of the statements is/are correct?

- A** 1, 2 and 3 are correct
- B** only 1 and 2 are correct
- C** only 2 and 3 are correct
- D** only 1 is correct

Your answer

[1]

11 In spermatogenesis, crossing over of the chromatids of homologous chromosomes gives rise to genetic variation.

Which of the options, **A** to **D**, is the cell type in which crossing over occurs?

- A** primary spermatocyte
- B** secondary spermatocyte
- C** spermatogonium
- D** spermatid

Your answer

[1]

**12** The tail of a sperm cell generates whipping movements that enable the cell to swim.

Which of the options, **A** to **D**, is the component that generates movement in the tail of a sperm cell?

- A** actin
- B** microtubule
- C** myosin
- D** troponin

Your answer

**[1]**

**13** Which of the options, **A** to **D**, is an action of luteinising hormone (LH) in males?

- A** inhibition of follicle-stimulating hormone (FSH) release
- B** initiation of spermatogenesis
- C** sensitisation of testicular cells to testosterone
- D** stimulation of testosterone release

Your answer

**[1]**

**14** The contraceptive pill is used to prevent pregnancy. The pill contains synthetic forms of oestrogen and progesterone.

Which of the options, **A** to **D**, is a mechanism by which the pill prevents pregnancy?

- A** destruction of the corpus luteum
- B** inhibition of FSH and LH secretion
- C** thickening of the uterine lining
- D** stimulation of GnRH secretion

Your answer

**[1]**

15 Which of the options, **A** to **D**, is the location of ATP synthase in a chloroplast?

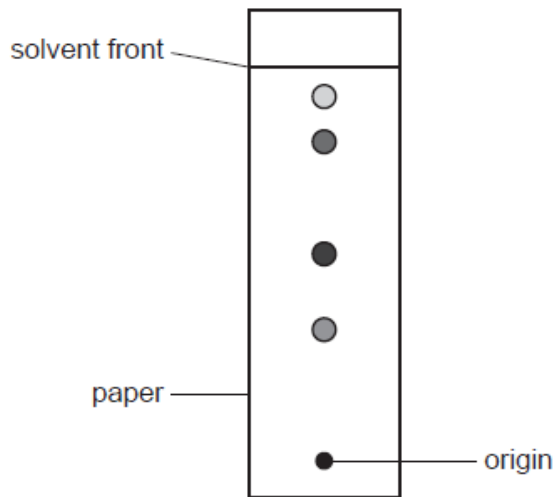
- A inner membrane
- B stroma
- C thylakoid lumen
- D thylakoid membrane

Your answer

[1]

16 Photosynthetic pigments in a leaf were separated using paper chromatography.

The resulting chromatogram is shown below.



Which of the options, **A** to **D**, is the retention factor ( $R_f$ ) for the most soluble pigment?

- A 0.33
- B 0.93
- C 1.07
- D 3.04

Your answer

[1]



**17** Proton pumps establish electrochemical gradients, which are required for ATP production.

Which of the options, **A** to **D**, are regions of a plant cell **into** which protons are pumped?

- A** chloroplast stroma and mitochondrial intermembrane space
- B** chloroplast stroma and mitochondrial matrix
- C** thylakoid space and mitochondrial intermembrane space
- D** thylakoid space and mitochondrial matrix

Your answer

**[1]**

**18** Which of the molecules, **A** to **D**, is the source of electrons in photosynthesis?

- A** ATP
- B** CO<sub>2</sub>
- C** H<sub>2</sub>O
- D** NADPH

Your answer

**[1]**

**19** DCPIP is a molecule that is used to measure the rate of the Hill reaction in isolated chloroplasts.

Which of the options, **A** to **D**, correctly describes DCPIP during the Hill reaction?

- A** it becomes oxidised
- B** it loses electrons
- C** it mimics NADP
- D** it turns from colourless to blue

Your answer

**[1]**

**20** Photolysis is the process of splitting water using light energy.

Which of the options, **A** to **D**, is the region of the chloroplast in which this process takes place?

- A** outer membrane
- B** stroma
- C** thylakoid lumen
- D** thylakoid membrane

Your answer

**[1]**

**21** The statements below relate to the Calvin cycle.

Which of the following statements is/are correct?

- 1** Molecules of triose phosphate are required for the synthesis of nucleic acids.
- 2** The production of triose phosphate from glycerate-3-phosphate requires ATP and reduced NAD.
- 3** Reactions of the Calvin cycle occur at a faster rate when stomata are closed.

- A** 1, 2 and 3 are correct
- B** only 1 and 2 are correct
- C** only 2 and 3 are correct
- D** only 1 is correct

Your answer

**[1]**

**22** Which of the options, **A** to **D**, is the number of molecules of triose phosphate required to produce **two** molecules of glucose?

- A** 1
- B** 2
- C** 4
- D** 8

Your answer

**[1]**

**23** The table below shows some energy data for a forest ecosystem.

total plant biomass	70 000 kcal m <sup>-2</sup>
total animal biomass	4 300 kcal m <sup>-2</sup>
gross primary productivity	18 000 kcal m <sup>-2</sup> yr <sup>-1</sup>
animal respiration	2 900 kcal m <sup>-2</sup> yr <sup>-1</sup>
plant respiration	6 500 kcal m <sup>-2</sup> yr <sup>-1</sup>

Which of the options, **A** to **D**, is the net primary productivity of the ecosystem in kcal m<sup>-2</sup> yr<sup>-1</sup>?

**A** 11 500

**B** 24 500

**C** 52 000

**D** 92 300

Your answer

**[1]**

- 24 A student investigated biodiversity in adjacent woodland and wetland habitats. The results are summarised in the table below.

Species	Woodland	Wetland
P	5	11
Q	2	0
R	23	10
S	0	9
total ( $N$ )	30	30

Simpson's index of diversity ( $D$ ):  $D = 1 - \left( \sum \left( \frac{n}{N} \right)^2 \right)$

Which of the following statements is/are correct?

- 1 The species richness of woodland and wetland are the same.
- 2 The wetland area has the greater Simpson's index of diversity.
- 3 In the formula for  $D$  shown above,  $\sum \left( \frac{n}{N} \right)^2$  is always less than or equal to 1.

- A** 1, 2 and 3 are correct  
**B** only 1 and 2 are correct  
**C** only 2 and 3 are correct  
**D** only 1 is correct

Your answer

[1]

- 25 Which of the options, **A** to **D**, would promote flowering in a short-day plant?

- A** longer exposure to cold temperatures  
**B** longer exposure to darkness  
**C** shorter exposure to cold temperatures  
**D** shorter exposure to darkness

Your answer

[1]

**26** Fertilisation in a flowering plant involves two pollen nuclei.

The first nucleus fuses with the ovule and the second nucleus fuses with the polar nuclei.

Which of the options, **A** to **D**, is the seed structure formed after fusion of the second nucleus with the polar nuclei?

**A** aleurone layer

**B** embryo

**C** endosperm

**D** seed coat

Your answer

**[1]**

**27** Which of the options, **A** to **D**, is the component of a cereal grain that contains starch?

**A** aleurone layer

**B** embryo

**C** endosperm

**D** seed coat

Your answer

**[1]**

**Total Marks for Question Set 4: 27**

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