

Name White version Wed Mar 25

Student number _____

Answer questions 1-20 on the computer scoring sheet.

Value 2 marks each

- Which hemoglobin form is expressed during **months 2-9 of pregnancy**?
A) $\zeta\zeta\beta\beta$ B) $\epsilon\epsilon\beta\beta$ **C) **aagg****
D) $\alpha\alpha\delta\delta$ E) $\epsilon\epsilon\gamma\gamma$ 1) A B C D E
- What are the characteristics of **hemoglobin variant bbbb** produced in α -thalassemia?
A) It binds O_2 like normal hemoglobin B) It binds O_2 like fetal hemoglobin
C) It is unable to bind O_2 **D) It binds O_2 like myoglobin**
E) It polymerizes into fibres in red blood cells 2) A B C D E
- Which of the following **correctly describes how CO_2 interacts** with hemoglobin?
A) CO_2 binds to heme Fe^{2+} B) CO_2 binds to heme Fe^{3+}
C) CO_2 binds to His F8 D) CO_2 binds to His E7
E) CO_2 binds to the N-terminal of α -globin 3) A B C D E
- Which of the following statements about **fetal hemoglobin** is **not correct**?
A) Fetal hemoglobin has higher affinity for O_2 than maternal hemoglobin A
B) Fetal hemoglobin has fewer positive charged amino acids at γ -globin C-terminal
C) Fetal hemoglobin binds 2,3-bisphosphoglycerate more strongly
D) The sigmoidal O_2 binding curve of fetal hemoglobin is shifted to the left
E) Fetal hemoglobin remains in R-state at lower pO_2 4) A B C D E
- Which of the following statements about the **sigmoidal O_2 binding curve** of hemoglobin is **not correct**?
A) Transition from almost empty to almost full occurs over a narrower range of pressures
B) It allows for more efficient release of O_2 at pO_2 found in peripheral tissues
C) Hemoglobin has higher P_{50} than myoglobin, but still reaches saturation at the same pO_2 as myoglobin
D) It allows more O_2 to bind to hemoglobin than to myoglobin at any given pO_2
E) It indicates that binding affinity increases as more sites are occupied 5) A B C D E
- Which of the following is responsible for activating **Protein kinase A**?
A) Cyclic AMP binds to R subunits of protein kinase A
B) Cyclic AMP binds to C subunits of protein kinase A
C) Cyclic AMP becomes available as phosphate donor
D) Cyclic AMP is hydrolyzed to 5'-AMP
E) The proenzyme form is cut by proteolysis 6) A B C D E

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7. Which of the following statements about **phosphorylase a** is **not correct**?
A) Phosphorylase **a** preferentially goes to the active R state
B) Phosphorylase a phosphorylates enzymes involved in glycogen metabolism
C) Phosphorylase **a** is converted to phosphorylase **b** by phosphoprotein phosphatase 1
D) Phosphorylase **a** is negatively regulated by glucose.
E) Serine 14 of phosphorylase **a** is phosphorylated 7) A B C D E
8. If **Cyclin E-Cdk2** activates **DNA replication proteins**, at what phase of the cell cycle does its **activity come to a peak**?
A) Progression through G1
B) **Entry to S phase**
C) Entry to G2 phase
D) Progression through G2 phase
E) Entry and progress through M phase 8) A B C D E
9. Which of the processes for **activation of pancreatic proenzymes** is **not correct**?
A) Enteropeptidase can activate trypsinogen B) Trypsin can activate trypsinogen
C) Chymotrypsin can activate trypsinogen D) Trypsin can activate chymotrypsinogen
E) Trypsin can activate Procarboxypeptidase 9) A B C D E
10. Which of the following **correctly describes** the role of **tissue plasminogen activator**?
A) promotes clotting by activating fibrinogen B) promotes clotting by activating prothrombin
C) prevents clotting by binding to fibrinogen D) prevents clotting by binding to prothrombin
E) promotes the dissolution of clots 10) A B C D E
11. Which of the following does not play a role in the **blood clotting cascade**?
A) Fibrinogen B) Prothrombin
C) **Protein kinase A**
D) Factor Xa E) Factor VIII 11) A B C D E
12. What is the mechanism by which **caffeine stimulates glycogen breakdown**?
A) Caffeine inhibits breakdown of cyclic AMP
B) Caffeine is an allosteric activator of glycogen phosphorylase
C) Caffeine inhibits phosphoprotein phosphatase
D) Caffeine binds to protein kinase A
E) Caffeine stimulates production of cyclic AMP 12) A B C D E
13. Which of the following enzymes is **not required for gluconeogenesis** in liver?
A) PEP carboxykinase B) Pyruvate carboxylase C) Fructose-1,6-bisphosphatase
D) Pyruvate kinase E) Glucose-6-phosphatase 13) A B C D E

14. Which of the following enzymes is **directly involved in production of NADPH**?
A) Lactate dehydrogenase B) Glyceraldehyde-3-phosphate dehydrogenase
C) Pyruvate dehydrogenase **D) Glucose-6-phosphate dehydrogenase**
E) Phosphofructokinase 14) A B C D E
15. How many steps in the gluconeogenesis pathway **yield ATP as a product**?
A) 0 B) 1 C) 2 D) 4 E) 6 15) A B C D E
16. Which of the following is used as **substrate** by **glycogen synthase**?
A) UTP-Glucose **B) UDP-Glucose** C) Glucose-1-phosphate
D) Glucose-6-phosphate E) Glucose + ATP 16) A B C D E
17. Which of the following is the **initiator procaspase** activated by external signals such as **tumour necrosis factor**?
A) Procaspase 1 B) Procaspase 3 C) Procaspase 7
D) Procaspase 8 E) Procaspase 9 17) A B C D E
18. Which of the following properties is directly related to the **concentration of 5'-AMP as an indicator of energy status**?
A) 5'-AMP level is correlated with high [ATP]
B) 5'-AMP level is correlated with [ADP]
C) 5'-AMP level is controlled by external hormones
D) 5'-AMP level is controlled by phosphofructokinase 2
E) 5'-AMP level is correlated with the square of [ADP] 18) A B C D E
19. If **transketolase** accepts the xylulose-5-phosphate and erythrose-4-phosphate as substrate, **what products are released**?
A) Sedoheptulose-7-phosphate and glyceraldehyde-3-phosphate
B) Fructose-6-phosphate and glyceraldehyde-3-phosphate
C) Ribulose-5-phosphate and glyceraldehyde-3-phosphate
D) Dihydroxyacetone-3-phosphate and glucose-6-phosphate
E) Dihydroxyacetone-3-phosphate and ribose-5-phosphate 19) A B C D E
20. What compound is **exported from mitochondria** to provide substrate gluconeogenesis in the cytoplasm when **lactate** is the starting point?
A) Pyruvate B) Malate C) Oxaloacetate
D) PEP E) Acetyl CoA 20) A B C D E