Introduction to Biochemistry Workbook Answers 2010

Element 1

1. Amino acids are formed from large chains of proteins. T / F

2. Which of the following is not one of the functional groups present on an amino acid

   a) amine group

   b) bromine group

   c) carboxylic acid

3. Which of the following is identified by the abbreviation Glu

   a) glutamine

   b) glycine

   c) glutamate

4. Aliphatic amino acids do not have a polar region and are totally nonpolar structures T / F

5. All aromatic amino acids have an identifiable odour. . T / F

6. Which of the following contains sulphur

   a) cysteine

   b) alanine

   c) serine

7. Define the term essential amino acid.

An essential amino acid cannot be made in the body and must be gained from the diet

8. Which of the following is transferred during transamination.

a) NH_1

b) NH_2

c) NH_3

d) NH_4

9. The ammonia that is produced from deamination needs to be converted to urea. T / F

10. Which of the following is involved in the urea cycle

a) arginine

b) citrulline

c) ornithine

d) all of the above

11. State why there must be a continual production of aspartate for the urea cycle.

Because aspartate donates a NH_2 group in the urea cycle and in the process becomes fumarate. This needs to be reformed as aspartate to donate another amine goup

Box 25-162, St Heliers, Auckland 1740, New Zealand •• Ph: 64-9-521-9034 •• Em: admin@icpkp.com •• www.icpkp.com

12. A keto-acid is an amino acid that has been

a)	deaminated
b)	transaminated
c)	either of the above
d)	neither of the above

Box 25-162, St Heliers, Auckland 1740, New Zealand •• Ph: 64-9-521-9034 •• Em: admin@icpkp.com •• www.icpkp.com

Element 2

1. Copying of the DNA into mRNA is called **transcription / translation**. *(Circle one)*

2. How many bases are located within each codon

   a) 1

   b) 2

   c) 3

   d) 4

3. The difference between thymine and uracil is a **methyl / propyl** group. *(Circle one)*

4. Which of the following is not found in a ribosome

   a) large subunit

   b) medium subunit

   c) small subunit

5. The portion of the tRNA that binds with amino acids is the

   a) T arm

   b) D arm

   c) Anticodon

   d) None of the above

Box 25-162, St Heliers, Auckland 1740, New Zealand •• Ph: 64-9-521-9034 •• Em: admin@icpkp.com •• www.icpkp.com

6. Amino acids bind to the tRNA via esterification. T / F

7. Describe the process of the formation of the peptide bond that forms between adjacent amino acids.

The amine group of one amino acid is joined to the carboxyl group of another and this liberates water but joins the two amino acids together, bonding the N to the C

8. There are three amino acids joined together is a **dipeptide / tripeptide**. *(Circle one)*

9. Free ribosomes produce proteins for use **inside / outside** the cell. *(Circle one)*

10. The structural level of organisation in which several proteins are joined together is the

a) primary level

b) secondary level

c) tertiary level

d) quaternary level

11. Which of the following is not a function of proteins:-

a) transport

b) nerve impulses

c) precursor of cholesterol

Box 25-162, St Heliers, Auckland 1740, New Zealand •• Ph: 64-9-521-9034 •• Em: admin@icpkp.com •• www.icpkp.com

12. Collagen is a **globular** / **fibrous** protein. *(Circle one)*

13. An acidic pH may denature a protein. T / F

Box 25-162, St Heliers, Auckland 1740, New Zealand •• Ph: 64-9-521-9034 •• Em: admin@icpkp.com •• www.icpkp.com

Element 3

1. Define the following terms:-

monosaccharide:- **an individual sugar unit**

disaccharide:- **two sugar units joined together**

polysacchararide:- **many sugar units joined together**

2. Name the monosaccharide with six carbons in its structure:-

a) octose

b) triose

c) hexose

3. Which of the following is the most common in the diet:-

a) glucose

b) galactose

c) fructose

4. A chiral carbon is attached to four **identical / different** groups. *(Circle one)*

5. Glucose is most commonly found as a **hemiacetal / hemiketal**. *(Circle one)*

6. Differentiate between the alpha form and the beta form of carbohydrates:

In the alpha form of hemiacetal carbohydrates, the OH group is located below carbon 1 whilst in the beta form the OH group is located above the first carbon.

7. Which of the following is formed from a glucose and fructose jointed together.

a) maltose

b) sucrose

c) lactose

8. Describe why humans cannot digest cellulose:-

humans lack the enzymes required to break the beta linkages between molecules

9. Differentiate between a monomer and a polymer:-

a monomer is an individual unit and a polymer is form from many monomers

10. There are no **α-1-4** / **α-1-5** glycosidic linkages in carbohydrates*(Circle one)*

11. **Amylopectin** / **glycogen** is the storage form of glucose for humans. *(Circle one)*

Box 25-162, St Heliers, Auckland 1740, New Zealand •• Ph: 64-9-521-9034 •• Em: admin@icpkp.com •• www.icpkp.com

12. Which of the following is defined as the formation of glucose into glycogen.

a)	glycogenesis
b)	glycogenolysis
c)	glycolysis
d)	gluconeogenesis

13. State why glucose is not an efficient storage form of carbohydrate.

because it is osmotically attractive and would attract water into the cell - swelling it

Box 25-162, St Heliers, Auckland 1740, New Zealand •• Ph: 64-9-521-9034 •• Em: admin@icpkp.com •• www.icpkp.com

Unit 4

1. Describe the interrelationship between ADP and ATP:-

ADP gains a phosphate to become ATP which loses a phosphate to become ADP

2. Which of the following is not involved in the production of ATP

a) glycolysis

b) urea cycle

c) electron transport chain

3 Creatine phosphate directly transfers a phosphate group to ADP. T / F

4. Creatinine is excreted via the **urine**

5. The enzymes for glycolysis are located within the **cytoplasm** / **mitochondria**. *(Circle one)*

6. Which of the following is not an electron carrier

a) FAD

b) NAD^+

c) TAD

Box 25-162, St Heliers, Auckland 1740, New Zealand •• Ph: 64-9-521-9034 •• Em: admin@icpkp.com •• www.icpkp.com

7. Glycolysis is an **aerobic** / **anaerobic** process. *(Circle one)*

8. In glycolysis, the **first** / **second** series of reactions requires energy input. *(Circle one)*

9. Lactic acid becomes pyruvic acid if there is inadequate oxygen during ATP production. T / F

10. Describe the function of the Cori cycle

to remove the pyruvic acid from the cell and form it into a substance that can pass through the blood to the liver to be reformed as pyruvic acid

Box 25-162, St Heliers, Auckland 1740, New Zealand •• Ph: 64-9-521-9034 •• Em: admin@icpkp.com •• www.icpkp.com

Element 5

1. Which of the following is true regarding the mitochondria

   a) it has three membranes

   b) the space within the inner membrane is called the matrix

   c) it has no DNA within it

2. Which of the following is joined to an acetyl group

   a) coenzyme A

   b) coenzyme B

   c) coenzyme C

   d) coenzyme D

3. The Krebs cycle functions to **oxidise** / **reduce** the acetyl group completely. *(Circle one)*

4. For every turn of the Krebs cycle there are

   a) 2 molecules of NADH $+H^+$ formed.

   b) 3 molecules of NADH $+H^+$ formed.

   c) 4 molecules of NADH $+H^+$ formed.

5. Electrons and hydrogens from the Krebs cycle pass to the

   a) proton transport chain

   b) neutron transport chain

   c) electron transport chain

Box 25-162, St Heliers, Auckland 1740, New Zealand •• Ph: 64-9-521-9034 •• Em: admin@icpkp.com •• www.icpkp.com

6. Oxidation of $FADH_2$ yields **more / less** ATP than oxidation of NADH $+H^+$ *(Circle one)*

7. Describe the role of ATP synthase

to rotate due to hydrogen ion movement and in the rotation, pick up phosphate groups and attach them to ADP molecules

8. The electrons move through the electron transport chain and are finally donated to

a) carbon

b) nitrogen

c) oxygen

9. Which of the following is a shuttle that passes electrons into the mitochondria

a) the glycerol phosphate shuttle

b) the malate shuttle

c) both of the above

d) neither of the above

10. Identify the waste products from the complete breakdown of glucose

CO_2 and H_2O

11. Balance the following chemical reaction:-

$$C_6H_{12}0_6 + \mathbf{6}O_2 \rightarrow \mathbf{6}CO_2 + \mathbf{6}H_2O + \textbf{energy}$$

12. The aerobic system of ATP production is used for activities of long duration. T / F

Box 25-162, St Heliers, Auckland 1740, New Zealand •• Ph: 64-9-521-9034 •• Em: admin@icpkp.com •• www.icpkp.com

Element 6

1. Tri-acyl-glycerides contain

   a) one fatty acid attached to glycerol

   b) two fatty acids attached to glycerol

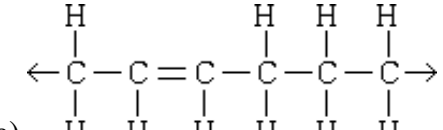
   c) three fatty acids attached to glycerol

   d) four fatty acids attached to glycerol

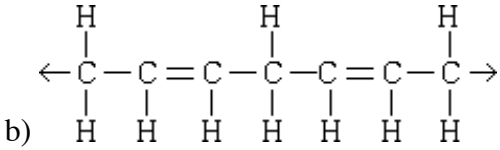
2. The reactive end of a fatty acid is the **methyl / carboxylic** acid end. *(Circle one)*

3. Which of the following diagrams shows a monounsaturated fatty acid:-

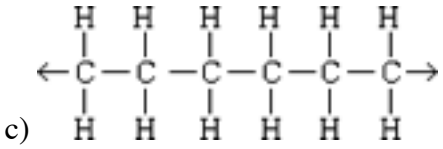
a)



b)



c)



4. Which of the following is not an essential fatty acid

   a) linoleic acid

   b) linolenic acid

   c) linotropic acid

Box 25-162, St Heliers, Auckland 1740, New Zealand •• Ph: 64-9-521-9034 •• Em: admin@icpkp.com •• www.icpkp.com

5. Fatty acids join to a glycerol via esterification. T / F

6. Synthesising lipids is called **lipolysis** / **lipogenesis**.. *(Circle one)*

7. Catabolism of **fatty acids** / **glycerol** occurs via beta-oxidation. *(Circle one)*

8. Describe the role of carnitine acyl transferase in the mitochondrial membrane

transfers the long chain fatty acid into the mitchondrion

9. Ketone bodies are formed due to **decreased** / **increased** levels of acetyl coenzyme A. *(Circle one)*

10. Which of the following is not a function of lipids.

a) synthesis of steroids

b) insulation

c) transport of water soluble substances

Box 25-162, St Heliers, Auckland 1740, New Zealand •• Ph: 64-9-521-9034 •• Em: admin@icpkp.com •• www.icpkp.com

Element 7

1. Which of the following is not a class of a lipid

   a) sulpholipids

   b) phospholipids

   c) sphingolipids

   d) glycolipids

2. State the constituents of waxes

   fatty acid **long chain alcohol**

3. Which of the following is not found in a phospholipid

   a) fatty acids

   b) glucose

   c) phosphate

   d) choline

4. Arachidonic acid is cleaved from a phospholipid by phospholipase $\mathbf{A_1}$ / $\mathbf{A_2}$. *(Circle one)*

5. Which of the following is formed from arachidonic acid

   a) leukotrienes

   b) prostaglandins

   c) thromboxanes

   d) all of the above

   e) none of the above

Box 25-162, St Heliers, Auckland 1740, New Zealand •• Ph: 64-9-521-9034 •• Em: admin@icpkp.com •• www.icpkp.com

6. State one location that sphingolipids might be found in the body:

myelin sheaths of neurons in the nervous system

7. Glycolipids contain glycogen attached to the glycerol molecule. T / F

8. A **ceramide** / **cerebroside** does not contain a carbohydrate. *(Circle one)*

Box 25-162, St Heliers, Auckland 1740, New Zealand •• Ph: 64-9-521-9034 •• Em: admin@icpkp.com •• www.icpkp.com

Element 8

1. Which of the following is not found in a cholesterol molecule

   a) A ring

   b) B ring

   c) C ring

   d) D ring

   c) E ring

2. An isoprene unit is a chain of **5** / **8** carbon atoms. *(Circle one)*

3. Cholesterol is an example of a

   a) monoterpene

   b) sesquiterpene

   c) diterpene

   d) triterpene

4. Squalene is a precursor substance in the formation of cholesterol. T / F

5. Cholesterol is located within the

   a) cell membrane

   b) cytoplasm

   c) cell inclusions

6. ~~The hydroxyl~~ group attached to the A ring makes that portion of the molecule **hydrophylic / hydrophobic**. *(Circle one)*

7. Bile is imortant in the digestion of **fat / protein**. *(Circle one)*

8. Which of the following is a bile salt that is derived from cholesterol

   a) glycoholic acid

   b) taurocholate

   c) both of the above

   d) neither of the above

9. Estradiol is directly formed from **testosterone / androstenedione**. *(Circle one)*

10. Progesterone is not a precursor of

    a) corticosterone

    b) calcitriol

    c) cortisol

Box 25-162, St Heliers, Auckland 1740, New Zealand •• Ph: 64-9-521-9034 •• Em: admin@icpkp.com •• www.icpkp.com

Element 9

1. The liver is located on the **right** / **left** side of the body. *(Circle one)*

2. Which of the following is a not function of the liver

   a) protein metabolism

   b) detoxificaton of drugs

   c) activation of vitamin C

   d) storage of minerals

3. Describe the role of the hydrochloric acid in the digestion of proteins.

   to break hydrogen bonds within the protein to denature it

4. Which of the following regulates the production of platelets by the bone marrow

   a) angiotensinogen

   b) albumin

   c) thrombopoeitin

   d) insulin like growth factor

5. Which of the following is not a brush border enzyme

   a) amylase

   b) maltase

   c) sucrase

   d) lactase

6. State the role of attaching a phosphate to glucose upon entry to the hepatocyte.

to trap the glucose in that cell

7. Which of the following is not used in gluconeogenesis

a) lactic acid

b) glucogenic amino acids

c) fatty acids

8. Those amino acids that can only form acetyl coenzyme a are **ketogenic / glucogenic**.

9. Describe the role of bile in the digestion of fats.

to emulsify the fat to increase the surface area so the pancreatic lipase can act better

10. Enterohepatic circulation allows the absorption of most bile salts. T / F

11. Which of the following contains the highest proportion of triacylglyceride

a) chylomicron

b) HDL

c) LDL

d) VLDL

Box 25-162, St Heliers, Auckland 1740, New Zealand •• Ph: 64-9-521-9034 •• Em: admin@icpkp.com •• www.icpkp.com

12. Which of the following allows the endocytosis of LDLs

a) Apoprotein A

b) Apoprotein B

c) Apoprotein C

d) Apoprotein D

e) Apoprotein E

13. Lipoprotein lipase prevents the fatty acid from entering the adipocytes. T / F

14. The function of the HDLs is to transport cholesterol **to** / **from** the liver. *(Circle one)*

15. The combination of a fatty acid to the cholesterol forms a cholesterol **ether** / **ester**.

16. HDLs may **increase** / **decrease** activity of PGE1 and PGE3. *(Circle one)*

Box 25-162, St Heliers, Auckland 1740, New Zealand •• Ph: 64-9-521-9034 •• Em: admin@icpkp.com •• www.icpkp.com

Element 10

1. Oxidation is a **phase I** / **phase II** reaction of the P450 series of enzymes. *(Circle one)*

2. Describe the role of conjugation in detoxifying substances in the liver.

to combine the substance with another substance to increase the ability of the whole substance to pass through the blood to the kidneys for excretion

3. Which of the following is not an enzyme in the metabolism of aclohol

a) alcohol dehydrogenase

b) aldehyde dehydrogenase

c) acetic acid dehydrogenase

4. An increased ratio of NADH + H^+ **increases** / **decreases** the beta oxidation of fatty acids. *(Circle one)*

5. **Free radical ions** / **antioxidants** are produced during the metabolism of alcohol by the ~~cytochrome P450~~ series of enzymes.

6. Ethanol content of alcohol is measure as a v / v% in which the measurement is

a) the number of grams of ethanol per ml

b) the number of ml of alcohol per litre of fluid

c) the number of ml of alcohol per 100 ml of fluid

7. In the breaking down of a red blood cell, which of the following is conjugated to bilirubin

   a) glycogen

   b) glycerinate

   c) glucuronate

8. **Stercobilin / urobilin** is excreted via the kidneys. *(Circle one)*

9. Betacarotene is formed from **2 / 4** molecules of vitamin A joined together. *(Circle one)*

10. The retinol form of vitamin a is an **alcohol / aldehyde**. *(Circle one)*

11. The livers role in the metabolism of vitamin D is to

    a) break the B ring to modify the structure

    b) hydroxylate carbon 1

    c) form a double bond

    d) hydroxylate carbon 25

12. Vitamin K in a co-enzyme that aids **carboxylation / decarboxylation** of clotting factors.

Box 25-162, St Heliers, Auckland 1740, New Zealand •• Ph: 64-9-521-9034 •• Em: admin@icpkp.com •• www.icpkp.com

13. Statin drugs are used for patients with elevated cholesterol because stating inhibits HMG coA reductase. What is the implication of this in terms of cholesterol synthesis.

This enzyme is responsible for the formation of cholesterol and by inhibiting the enzyme, there is a reduced production of cholesterol and therefore a reduced level in the blood. This is required as these individuals have an elevated amount anyway.

Box 25-162, St Heliers, Auckland 1740, New Zealand •• Ph: 64-9-521-9034 •• Em: admin@icpkp.com •• www.icpkp.com