BIOCHEMISTRY TEST BANK

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1) A solution of a weak base (B) with a Volume of 2 L, Concentration = 0.01 M, pH =9, upon the addition of 0.685 g of its salt (BHCL), the pH value changed by a 3 unit difference, the M.W of the Salt BHCL (Hint: [B] remains the same): –

A. 68.5

B. 34.25

C. 6.85

D. 137

Answer: B

2) You have been observing an insect that defends itself from enemies by secreting a liquid. Analysis of lipid shows it to have a concentration of formic acid (Ka= 1.8 * 10–4) of 1.45M and a concentration of formate ion of 0.015M what is the pH of the secretion?

A. 5.73

B. 1.76

C. 7

D. 3.37

E. 1.91

Answer:B

3) you prepare a sodium phosphate buffer by mixing 100ml of 0.1 M Na2HPO4 with 100ml of 0.1 M NaH2PO4 . The pH of the final solution is 7.8 what is the approximate PKa of the acid component of the buffer?

A. 7.8

B. 10 to the power of – 5.8

C. 10 to the power of 7.8

D. 6.8

E. 5.8

Answer: A

4) in a titration curve of a weak acid the point in the plateau region between that inflection point and the equivalence point has the following characteristics

A. it has a higher concentration of weak acid than the conjugate base

B. all the equivalents needed for the titration were used up

C. can act as a buffer

D. the pH of the solution is definitely above 7

E. repeat value equals the value of the acid PKa

Answer: C

5) Given a choice between acid A and acid B:-

A. Acid A is stronger if its conjugate base is stronger than that of Acid B.

B. Acid A is stronger if its conjugate base is weaker than that of Acid B.

C. Acid A is stronger if its conjugate base is a more complex ion than that of Acid B.

D. Acid A is stronger if its conjugate base is a noble gas.

E. There is no way to compare acid strength based on any of these factors

Answer: B

6) 4.13g OF NaC2H7O4 is added to 250 mL of a 0.150 M HC2H7O4 solution. With a Ka= $2.75*10-5$, M.W of the salt 202.14 g/mol, what is the pH of the buffer system?

A. 6.54

B. 5.43

C. 4.28

D. 7.42

Answer: C

7) A type 1 diabetic is brought to the emergency department due to lethargy and rapid breathing. Blood measurements indicated elevated levels of glucose and ketone bodies. Blood pH was 7.1. The patient was exhibiting enhanced breathing to exhale which one of the following gases in order to correct the abnormal blood pH?

A. Oxygen

B. Nitrogen

C. Nitrous oxide

D. Carbon dioxide

E. Superoxide

Answer D

8) Water is the universal solvent for biological systems. Compared to ethanol, for example, water has a relatively high boiling point and high freezing point. This is due primarily to which one of the following properties of water?

A) Its hydrophobic effect

B) Ionic interactions between water molecules

C) The pH

D) Hydrogen bonds between water molecules

E) Van der Waals interactions

ANSWER: D

9) When the pH of a solution of a weak acid, HA, is equal to the pKa., the ratio of the concentrations of the salt and the acid ($[A-]/[HA]$) is which one of the following?

A) O

B) I

C) 2

D) 3

E) 4

ANSWER: B

10) Which one of the following types of bonds is covalent?

(A) Hydrophobic

(B) Hydrogen

(C) Disulfide

(D) Electrostatic

(E) Van der Waals

ANSWER: C

11) A patient attempted suicide by ingesting 50 aspirin tablets. This led to a fairly severe metabolic acidosis. A decrease of blood pH from 7.5 to 6.5 would be accompanied by which one of the following changes in ion concentration?

A. A 10-fold increase in hydrogen ion concentration

B. A 10-fold increase in hydroxyl ion concentration

C. An increase in hydrogen ion concentration by a factor of 7.5/6.5

D. A decrease in hydrogen ion concentration by a factor of 6.5/7.5

E. A shift in concentration of buffer anions, with no change in hydrogen

ANSWER: A

12) Water molecules have _____ than molecules of similar size, such as ammonia and methane, reflecting its capacity to absorb large amounts of heat.

A. less surface tensions

B. a higher boiling point

C. a lower capacity for forming hydrogen bonds

D. a lower melting point

Answer: B

13) A 2-year-old child presents with metabolic acidosis after ingesting an unknown number of flavored aspirin tablets. At presentation, her blood pH was 7.0. Given that the pKa of aspirin (salicylic acid) is 3, calculate the ratio of its ionized to unionized forms at pH 7.0:

ANSWER : 10000

14) Although van der Waals forces are small. hydrophobic substances form cohesive droplets in aqueous solutions due to:

A. Ionic bonding between water molecules

B. Hydrogen bonding between water molecules, forming cages around the nonpolar droplets

C. Stabilization of the hydrophobic phase by van der Waals interactions between water molecules

D. The strong van der Waals forces between the nonpolar molecule

E. Formation of insoluble lipid droplets

 Answer: B

15) The ability of water to form hydrogen bonds is attributed to:

A. the oxygen atom in a water molecule has a weak positive charge.

B. each of the hydrogen atoms in a water molecule is weakly negative in charge

C. the bonds that hold together the atoms in a water molecule are polar covalent bonds

Answer: C

16) Membrane formation occurs in part due to the lipid solubility in water because of which of the following?

A. Hydrogen bond formation between lipids and water

B. hydrophobic interaction between lipid molecules

C. hydrophobic interactions between lipids and water

D. van der Waals forces between lipids and water

E. covalent bond formation between lipids and water

Answer: B

17) Water can form the following noncovalent interactions except:

A. Hydrophobic interactions

B. Van der Waals interactions

C. electrostatic interactions

D. hydrogen bonding

Answer: A

18) The PKb of base is 2, what is the PH of a 0.01 M solution of the base?

A. 12

B. 8

C. 10

D. 11

E. 9

Answer: A

19) a decrease blood pH from 7.5 to 7 would be accompanied by which of the following changes in ion concentration?

A. A ten-fold decrease in hydrogen concentration

B. An increase in hydrogen ion concentration by a factor of 7.5 / 7

C. fivefold increase in hydroxyl ion concentration

D. shift in concentration of buffer and ions with no change in hydrogen ion concentration

E. A 3-fold increase in hydrogen add concentration

Answer: E

20) You want to turn a solution containing X moles of Ca(OH)2 into a buffer solution. Which of the following should you add?

a. 2X moles of acetic acid

b. X/2 moles of acetic acid

c. 2X moles of HCL

d. 3X moles of acetic acid

e. X moles of H2SO4

ANSWER: D

21) A patient has been diagnosed with enteropathy where intestinal bacteria secrete NH3 and it's transported to blood circulation through the portal vein. What happens to the body?

A. Metabolic alkalosis

B. Respiratory acidosis

C. Respiratory alkalosis

D. Metabolic acidosis

E. Does not have any effect as the bicarbonate buffer system is not affected.

Answer: A

22) Untreated diabetic patient will have?

A. Metabolic alkalosis

B. Metabolic acidosis

C. Respiratory alkalosis

D. Respiratory acidosis

Answer: B

23) Homeostasis maintains a blood plasma pH ranging between 7.35 and 7.45. The kidneys control the amount of bicarbonate ion, and the lungs control the amount of carbon dioxide in plasma. If a person suffered from acidosis (caused, perhaps, by drinking acid):

A. The respiratory system would hypoventilate, keeping more CO_2 in the plasma

B. The lungs would hyperventilate, keeping CO_2 levels high in plasma

C. The kidneys would remove HCO_3^- from blood plasma and excrete it into the urine

D. The lungs would hyperventilate, decreasing CO_2 in the plasma, and the kidneys would save HCO_3^- and excrete it into blood plasma

E. The kidneys would remove CO_2 and excrete it into blood plasma rather than into urine

Answer: D

24) If the pH of a solution decreased from 7.5 to 7. What change has occurred to the concentration of H_3O^+?

a) increased 3 times

b) Increased 5 times

c) Increased 500 times

d) Increased 10^5 times

e) Increased $10^{(1/2)}$ times

Answer: A

25) Which of the following pairs can't make acid/conjugate base pair?

a) CH_3CH_3 / CH_3CH_2

b) CH_3COOH / $CHCOO^-$

c) HSO_4^- / SO_4^{-2}

d) H_2CO_3 / $NaHCO_3$

e) H_3PO_4 / NaH_2PO_4

Answer: a

26) What's the best description of water ion product?

a- the product of the concentration of positively and negatively charged ions resulting from the dissociation of water.

b- The product of the concentration of positively and negatively charged ions resulting from the dissociation of electrolyte solutions.

c- The product of the concentration of positively and negatively charged ions resulting from the dissociation of water and other electrolyte solutions.

d- None of the above

Answer: c27) Given pka of different acids, which one will have the strongest conjugate base when being dissociated with water?

a) 3.5

b) 2.9

c) 4.76

d) 7.2

e) 12.4

Answer: e

28) How many molecules of water dissociate into OH- and H_3O^+?

 a- one in 7

b- One in 10^7

c- One in 10^{12}

d- One in 10^{-7}

Answer: b

29) One of the following statements is not true about Carbonic acid/Bicarbonate buffer:

 a- The most common extracellular buffer.

b- Under physiological conditions the ratio of $[HCO_3^-]/[H_2CO_3]=20$.

c- Its buffering range is less than the desirable pH and that's compensated by CO_2 mobility.

d- When adding a strong acid, it will react with HCO3e- When adding a strong base, it will react with CO_3^{-2}

 E- Does not have any effect as the bicarbonate buffer system is not affected.

Answer: d

30) If you have X moles of KOH, how many moles of an acid must be added to have a buffer with equal concentrations of A- and HA?

a) X

b) X/2

c) 2X

 d) 1.5 X

e) None of the above

Answer: c

31) Which of the following acids or bases can make a buffer with its conjugate acid or its conjugate base?

a- HCl

b- KOH

 c- H2SO4

d-None of the above

Answer: d

32) 100 mmol of a triprotic acid were titrated with KOH. PKa values = 3, 6, 9. How many mmoles of KOH must be added to have pH=6?

a- 100

b- 150

c-250

d-300

Answer: b

33) If 10 mmoles of NaOH were dissolved in 1 L of water. What will be the pH of the solution?

a- 2

 b- 1

 c- 3

 d- 12

 e- 9

Answer: d

34) Sweating has a cooling effect because of water's high?

A. surface tension

B. density

C. heat of vaporization

D. buffering capacity

E. specific heat

Answer: C

35) The ability of water to form hydrogen bonds is attributed to: -

A. the oxygen atom in a water molecule has a weak positive charge.

B. each of the hydrogen atoms in a water molecule is weakly negative in charge

C. the bonds that hold together the atoms in a water molecule are polar covalent bonds

Answer: C

36) The PKb of base is 2 , what is the PH of a .01 M solution of the base?

A. 12

B. 8

C. 10

D. 11

E. 9

Answer : a

37) What is the pH if the concentration of the conjugate base (A−) is 0.35M and the concentration of the weak acid (HA) is 0.25M after adding 0.05 M of NaOH ? (pKa = 7) A. pH =7.3

B. pH=6.3

C. pH=8.6

Answer : A

38) What initial effects does hyperventilation have on the human's blood pH and H_2CO_3 concentration?

A. pH increases and [H_2CO_3] increases

B. pH increases and [H_2CO_3] decreases

C. pH decreases and [H_2CO_3] increases

D. pH decreases and [H_2CO_3] decreases.

Answer : B

39) Gastric juice (pH= 1.4) compared to human's blood (pH= 7.4):

A. [H^+] in gastric juice is 6 times higher than in blood

B. [H^+] in gastric juice is 10^6 times higher than in blood

C. [H^+] in blood is 10^6 times higher than in gastric juice

D. [H^+] in gastric juice is 7 times higher than in blood

Answer : B

40) A medical student is attempting to understand the buffering system of the human body and has set up the following experiment in the lab to help with his understanding. Consider a biochemical reaction that is taking place in a Total 0.1 M buffer. The initial pH is 7.4, and the pKa of the buffer is 7.2. If, in a final reaction, a volume of 1.0 mL, 10 μmol of protons are generated, what would be the final pH of the solution?

A. 7.59

B. 7.25

C. 7.22

D. 7.00

E. 7.15

Answer: C

41) The pKb of a base is 4. If you have a 0.01M solution of this base, what is the pH?

A. 8

B. 9

C. 10

D. 11

E. 12

Answer: d

42) you prepare a sodium phosphate buffer by mixing 100ml of 0.1 M Na2HPO4 with 100ml of 0.1 M NaH2PO4 . The pH of the final solution is 7.8 what is the approximate PKa of the acid component of the buffer ?

A. 7.8

B. 10 to the power of – 5.8 C. 10 to the power of 7.8

D. 6.8

E. 5.8

Answer : A

43)hydrogen bonds can form between electronegative atoms such as oxygen and nitrogen and a hydrogen atom bonded to:

A. oxygen only

B. hydrogen

C. nitrogen only

D. carbon

E. an electronegative atom

 Answer : E

44) Buffers work the best at all these conditions except :

A. when the pH to be maintained using the buffer has a value close to the pKa of its acid component.

B. When the concentration of the acid component is equal to that of the base component.

C. When the acid component is completely dissociated

D. None of the above

Answer: C

45) during a short distance run, the muscles produce a large amount of lactic acid from their glucose stores. hyperventilation can be used for in this situation because:

A. Adds H+ lowering the pH of the blood

B. Increase the composition of bicarbonates

C. remove H+ raising the pH of the blood

D. c+e

E. decreases the production of carbonic acid

Answer : D46) We have a drug that has [HA] IONIZABLE ACID with pKa of 4.5, that enters the cell via the membrane , what is the best pH that enhances the entry of the drug ?

A. pH=1

B. Ph=4.8

C. PH=3.9

Answer : A

47) All of the following will cause mild or severe acidosis except:

A. the presence of ketone bodies in untreated diabetic patient

B. The production of acids like lactic acid during metabolism

C. Excessive breathing

D. Repeated vomiting from the stomach containing HCL.

Answer: D

48) Below is the pKa for weak acids, which weak acid will be approximately 9% dissociated at ph 3.88?

A. Acetoacetic acid (pKa=3.6)

B. Lactic acid (pKa=3.9)

C. Beta-hydroxyl butyric acid (pKa=4.6)

D. Propionic acid (pKa=4.9)

E. Imidazolium (pKa=5.9)

Answer: D

49) 4.13g OF NaC2H7O4 is added to 250 mL of a 0.150 M HC2H7O4

solution. With a Ka= 2.75*10^-5 , M.W of the salt 202.14 g/mol , What is the pH of the buffer system?

A. 6.54

B. 5.43

C. 4.28

D. 7.42

Answer: C

50) A buffer is made by adding 0.200 M HC2H3O2 and 0.150 M NaC2H3O2. If 0.005 mol of NaOH is added to 125 mL of this buffer,What is the pH? (Ka=1.8*10^-50 :-

A. 4.82

B. 4.18

C. 5.23

D. 6.47

Answer: A

51) Given that Ka for Pyruvate=3.1*10^-3 ,What is the pH of a buffer made by mixing 0.1 M Pyruvate with 0.12 M Sodium Pyruvate ?

A. 40.2

B. 2.45

C. 1.60

D. 2.59

Answer: D

52) One of the following statements is not true about Carbonic acid/Bicarbonate buffer:

A. The most common extracellular buffer.

B. Under physiological conditions the ratio of [HCO3-]/ [H2CO3] = 20.

C. Its buffering range is less than the desirable pH and that's compensated by CO2 mobility.

D. When adding a strong acid, it will react with HCO3-

E. When adding a strong base, it will react with CO3-2

Answer: E

53) What is the concentration of H2PO4 if we have 0.5 eq in 500ml ?

A. 0.5 M

B. 0.25 M

C. 1M

Answer: A

54) Below is the pKa of some weak acids. Which weak acid will be 91 % undissociated at pH=4.86?

A. Acetoacetic acid pka = 3.6

B. Lactic acid pKa=3.9

C. C- beta-hydroxyl butyric acid pka=4.8

D. propionic acid pka=4.9

E. Imidazolium pka=5.9

Answer: E

55) THE following pairs can't make a buffer when mixed together(TRUE OR FALSE)? NaOH / NaCH3COO & CH3CH3 / CH3CH2

ANSWER: TRUE

56) More CO2 is exhaled when:

a. Protein buffer system is activated

b. The cytosolic pH decreases

c. The pH of the blood increases

d. The pH of the blood decreases

e. The cytosolic pH increases

Answer: D

57) We have 5ml of HCl and it's titrated by 0.5 M of NaOH with a volume of 12 ml what is the pH of the acid :
A. 0.8
B. 0.08
C. 8
Answer: b

58) The concentration of an acid is 0.1 with a volume of 5 mL the MW is 10 the ka is $1*10^3$and it was titrated by NaOH that has a concentration of 0.5 M and volume of 12 mL How much the [H+] of the solution was?

A. 0.8

B. 1.4

C. 1.2

Answer: c

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