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THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF HEALTH SCIENCES
DEPARTMENT OF BASIC SCIENCES

BACHELOR OF PHARMACY HONOURS- LEVEL 03 - 2019/20
BSU3340- PHARMACEUTICAL CHEMISTRY I
NBT II

DATE: 11th MARCH 2020 DURATION: 1.5 HOURS

TIME: 09.00 a.m. – 10.30 a.m.

REGISTRATION NO: .....

This question paper consists of 12 pages with 20 Multiple Choice Questions (Part A) and 04 Short Answer Questions (Part B).

IMPORTANT INSTRUCTIONS TO CANDIDATES

- Write your Registration Number in the space provided.
- Answer **ALL questions**.
- **Multiple Choice Questions (Part A):** Indicate answers in the answer sheet provided by placing a cross (X) in **INK** in the relevant cage.
- Answers in pencil will **NOT** be marked.
- **Short Answer Questions (Part B):** Write answers within the space provided.
- Do not remove any page/part of this question paper from the examination hall.
- Mobile phones and the electronic equipment are **NOT** allowed. Leave them outside.

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ANSWER SHEET FOR PART A

Q. No.	(a)	(b)	(c)	(d)
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Part A – Multiple Choice Questions

(20 marks)

Choose the most suitable answer and indicate with a 'X' in the answer sheet provided.

1. A Bronsted-Lowry acid is defined as
   a) a proton donor
   b) a proton acceptor
   c) an electron pair donor
   d) a hydroxide ion producer

2. Of the following solutions, which has the greatest buffering capacity?
   a) 0.01 M CH_3COOH and 0.50 M CH_3COONa
   b) 1.0 M CH_3COOH and 0.001 M CH_3COONa
   c) 0.01 M CH_3COOH and 0.0090 M CH_3COONa
   d) They would all have the same capacity

3. Which statement is TRUE about buffers?
   a) pH of a buffer changes with dilution.
   b) pH of a buffer doesn't change with temperature.
   c) Buffer capacity decreases with the increase of molar concentration of acid and salt.
   d) The closer the pH to pKa of the acid, higher the buffer capacity.

4. A buffer solution can be made by dissolving equals moles of
   a) NH_3 and NH_4Cl
   b) HNO_3 and NaOH
   c) KBr and Na_3PO_4
   d) CH_3COOH and NaCl

5. Substances that can react as both acids and bases are called
   a) neutral compounds
   b) conjugate bases
   c) amphoteric substances
   d) conjugate acids

6. Of the following compounds given below which compound is a diprotic oxyacid?
   a) H_3PO_4
   b) HBr
   c) H_2SO_4
   d) CH_3COOH

7. Which of the following acid/base titrations cannot determine the equivalence point in an accurate manner?
   a) Strong acid/strong base
   b) Weak acid/weak base
   c) Strong acid/weak base
   d) Weak acid/strong base

8. Which one is the correct pair of spectator ions involved in the following neutralization reaction?

   $KOH(aq) + HCl(aq) \longrightarrow KCl(aq)_) + H_2O(l)$
   a) K^+ and OH^-
   b) H^+ and OH^-
   c) H^+ and Cl^-
   d) K^+ and Cl^-

9. The conjugate acid and the base of $[HPO_4]^{2-}$ are, respectively:
   a) $[PO_4]^{3-}$ and $[H_2PO_4]^-$
   b) H_3PO_4 and $[PO_4]^{3-}$
   c) H_3PO_4 and $[H_2PO_4]^-$
   d) $[H_2PO_4]^-$ and $[PO_4]^{3-}$

10. In which direction will the following equilibrium shift if a solution of $AgNO_3$ is added?

    $AgCl(s) \rightleftharpoons Ag^+(aq) + Cl^-(aq)$
    a) Shifts to the right
    b) Shifts to the left
    c) No change
    d) Cannot be predicted

11. What is the solubility product constant (Ksp) expression for Ag_2SO_4?
    a) $Ksp = [2Ag^+(aq)]\,[SO_4^{2-}(aq)]$
    b) $Ksp = [2Ag^+(aq)]^2\,[SO_4^{2-}(aq)]$
    c) $Ksp = [Ag^+(aq)]^2\,[SO_4^{2-}(aq)]$
    d) $Ksp = [Ag^+(aq)]\,[SO_4^{2-}(aq)]$

12. Ice is an example of
    a) polar molecular solid
    b) neutral molecular solid
    c) non-polar molecular solid
    d) polar and non-polar molecular solid

13. Which of the following is LESS soluble in hot water than in cold water?
    a) CO_2
    b) NaCl
    c) $NaNO_3$
    d) KBr

14. What is TRUE on a spontaneous reaction?
    a) $\Delta H = 0$
    b) $\Delta H < 0$
    c) $\Delta G < 0$
    d) $\Delta G > 0$

15. which equation is correct regarding an exothermic reaction?
    a) $\Delta H = 0$
    b) $\Delta H < 0$
    c) $\Delta G > 0$
    d) $\Delta H > 0$

16. If the crystal growth is faster than nucleation,
    a) colloidal particle would result.
    b) larger crystal would result.
    c) no particle would be formed.
    d) supersaturation would result.

17. What is the pH at the equivalence point of the titration of a strong acid with a strong base?
    a) 7
    b) 10
    c) 5.3
    d) 1

18. A measurement which on repetition gives same or nearly same result is called:
    a) accurate measurement.
    b) average measurement.
    c) same measurement.
    d) precise measurement.

19. What is the [OH^-(aq)] of a solution with pH of 9.0?
    a) 1×10^{-9} M
    b) 1×10^{-6} M
    c) 1×10^{-5} M
    d) 9 M

20. Consider the pair of numbers, 0.001 and 0.01250. Which one of the following choices gives the CORRECT significant of these numbers respectively?
    a) 1 and 3
    b) 2 and 4
    c) 1 and 4
    d) 3 and 3

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Part B –Short Answer Questions

(80 marks)

Write answers in the space provided.

1. a) Consider a weak acid, HA. Provide the chemical equation for the ionization of HA in aqueous solution. (05 marks)

   b) Derive the Henderson-Hasselbalch equation for HA. (05 marks)

c) Calculate the pH of a buffer solution containing a mixture of 0.25 M HA and 0.30 M A^-. (*Ka* for HA is 1.8×10^{-5}) (05 marks)

d) Explain whether the solution of NH_4NO_3 is acidic or basic. (05 marks)

2. a) List five (05) factors that affect the solubility of an ionic solid. (05 marks)

b) i. Calculate the dissolution enthalpy of LiCl in water using the data provided below. (05 marks)

LiCl Lattice energy: -834 $kJmol^{-1}$ LiCl Hydration energy: -884 $kJmol^{-1}$

ii. Determine whether the dissolution process is endothermic or exothermic. (02 marks)

iii. Does LiCl soluble in water at room temperature? Explain your answer. (03 marks)

c) What is coprecipitation? (05 marks)

3. a) Write the expression for the solubility product, Ksp, of saturated solution of a metal hydroxide $Zn(OH)_2$. (05 marks)

b) If the Ksp for the metal hydroxide is $4.5x\ 10^{-17}mol^3dm^{-9}$, calculate its molar solubility in pure water. (05 marks)

c) Calculate the pOH of the solution. (05 marks)

d) Calculate the pH of the solution. (05 marks)

4. Write balanced equations for the following redox reactions. (20 marks)

a) $MnO_4^{2-}(aq) + C_2O_4^{2-}(aq) \longrightarrow Mn^{2+}(aq) + CO_2(g)$ (in acidic medium)

b) $NO_3^-(aq) + Cl^-(aq) \longrightarrow NOCl(aq) + Cl_2(g)$ (in acidic medium)

c) NO_3^- (aq) + Zn (s) ⟶ Zn^{2+} (aq) + NH_4^+ (aq) (in acidic medium)

Reg No:.....

Name:.....

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