Q2: Answer (T) for True sentences or (F) for False sentences: (1 Mark each)

31- There are three equivalent resonance structures for acetate ion

32- In ethyne, the 2s and 2p orbitals are combined to form two hybrid orbitals sp^2, leaving one electron in each of two p orbitals

33- Ozonolysis of 2,3-dimethyl-2-butene gave propanone

34- Addition of HBr to propene gave regioisomer products

35- The addition of borane to alkene occurs so that the boron adds to the less substituted carbon

36- Heat is required to break C-C of ethane to give ethyl radical.

37- 1,3- Butadiene and 1- butyne aren't isomers.

38- Hydration of propene gave isopropanol.

39- Ozonolysis of 2- butene gave acetone.

40- Propyl cation is more stable than isopropyl cation

41- Raising the temperature of an endothermic reaction shifts the equilibrium to the forward direction.

42- The pH of NH_4Cl solution is given by: $pH = \frac{1}{2} pK_w - \frac{1}{2} pK_a - \frac{1}{2} \log C_{salt}$.

43- The solubility of $PbCrO_4$ in Na_2CrO_4 is higher than its solubility in water.

44- The colligative properties of dilute solutions depend on the molecular weight of the solute.

45- At constant pressure, adding helium gas will shift the following equilibrium: $2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}$, to the forward direction.

46- One of the conditions that favor the completeness of precipitation is the large K_{sp} value of the precipitate.

47- The pH of a 0.01M solution of barium hydroxide, $Ba(OH)_2$, is 12.0

48- The reaction: $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$ ($\Delta H = +53\ kJmol^{-1}$) is not affected by a change in pressure because it is an endothermic reaction.

49- The freezing point depression ΔT_f in dilute solutions is independent on the molal concentration (m) of the solute.

50- AgCl ($K_{sp} = 1.8 \times 10^{-10}$) can be precipitated on adding tap water ($[Cl^-] = 1.8 \times 10^{-10}$ M) to 0.01M Ag^+ ions.

End of Exam

Best Wishes: Prof. Dr. Ali A. Abdel-Hafez, Dr. Soliman A. Soliman

2C

	Assiut University- Faculty of Science Frist Semester- Final Exam 2025-2026 Chemistry Department	Program: General Level : (1) Date: 28/12/2025 Time: 2 h	
Course Title: General Chemistry I		Code: 100 C	
Instructors: *Prof. Dr. Maher M. A. Hamed; Prof. Dr. Bahaa M. Abu-Zied; Dr. Soliman A. Soliman; Dr. Ahmed A. K. Mohammed*			
Important:	No. of pages 3 / No. of questions 2	Total Marks: 50	

Q1: Shade (T) for True statements or (F) for False statements: (25 Marks; 1 mark each)

(1) At extremely low pressures or high temperatures real gases behave ideally.

(2) The diffusion rates of gases are directly proportional to the gas volumes and inversely proportional to the time taken.

(3) Gases like He, H_2, and O_2 have low values of "a" and T_c can be easily liquefied.

(4) Sugar and Silver iodide can be considered as isotropic substances, while Glass and Rubber are examples of anisotropic substances.

(5) Rise in compressibility factor Z with increasing pressure is due to the Van der Waals parameter "a".

(6) Andrews observed that above 31 °C there was no possibility of liquefaction of $CO_{2(g)}$ however great pressure applied.

(7) The product of pressure and volume of the given mass of a gas can be expressed as either $PV = nRT$ or $PV = (3/2)\ E$.

(8) As the temperature of a liquid is increased, both surface tension and viscosity decrease.

(9) Ag sol can be prepared either by the reduction of $AgNO_3$ with HCHO or by using Bredig's arc method.

(10) Cottrell precipitation is used for colloidal sewage purification.

(11) Heat of adsorption is the heat consumed during the adsorption of a gas by a solid.

(12) Adsorption of nitrogen gas at low temperature is used for investigating the surface area of solid materials.

(13) The advantage of hydrogen electrode is that it is easy to be prepared.

(14) Aluminum metal ($E^{o}_{red\ Al|Al^{3+}} = -1.66$ V) reacts with dilute H_2SO_4 to liberate H_2 ($E^{o}_{H_2/2H^+} = 0.0$ V).

(15) In the $Al \mid Al^{3+} \parallel Ag^+ \mid Ag$ cell, electrons flow from silver electrode through the wire to the aluminum electrode (standard reduction potential of $Ag|Ag^+ = +0.80$ V and $Al|Al^{3+} = -1.66$V).

(16) Bohr's model explains the spectral lines of the H_2 molecule.

(17) The Paschen series lies in the visible region of the electromagnetic spectrum.

(18) Core electrons are responsible for chemical reactions.

(19) H_2CO molecule has three resonance structures.

(20) The hybridization of C in CO_2 molecule is sp.

(21) The repulsion between bonding pairs is smaller than the repulsion between nonbonding pairs of electrons.

(22) The geometrical shape of PCl_3 molecule is trigonal planar.

(23) H_2^+ does not exist.

(24) The C_2 molecule has paramagnetic properties.

(25) In a bonding molecular orbital, the nuclei are attracted to an accumulation of electron density outside the internuclear region.

Q2: Shade the correct answer A, B, C or D in the following statements: (25 Marks; 1 mark each)

(26) At STP conditions, 10 gm of a gas occupies 5 liters. At what temperature will the volume be double at the same pressure?
(A) 273 K (B) – 273 °C (C) 546 K (D) 546 °C

(27) Equal volumes of $CO_{2(g)}$ and $C_3H_{8(g)}$ at the same condition (T, P) have equal .....
(A) masses (B) number of molecules (C) diffusion rates (D) all of these

(28) Critical temperature (T_c) for gases, CO_2, CH_4, O_2, and N_2 are 31.1 °C, – 81.9 °C, – 119 °C, and – 147 °C, respectively. Which of these gases has strongest intermolecular forces?
(A) CO_2 (B) CH_4 (C) O_2 (D) N_2

(29) If RMS velocity of a gas molecule is "C" at pressure P, what will be its RMS velocity at pressure 2P at the same temperature?
(A) 2C (B) C (C) 4C (D) ¼C

(30) The rate of evaporation of a liquid depends upon .....
(A) nature of liquid (B) surface area (C) temperature (D) all of these

(31) Which of the following techniques can be used for the determination of the charge type of colloidal particles?
(A) electrophoresis (B) electro-osmosis (C) electro-dialysis (D) dialysis

(32) Freundlich equation is applicable only to:
(A) Type I adsorption isotherm (B) Type II adsorption isotherm
(C) Type III adsorption isotherm (D) Type V adsorption isotherm

(33) Which of the following features is incorrect about physical adsorption?
(A) The bond between the adsorbent and adsorbate is van der Waals interaction.
(B) It is characterized by low heats of adsorption.
(C) It can easily be removed by the rise of temperature.
(D) One layer of adsorbed molecules may be formed.

(34) For the cell: $Zn \mid Zn^{2+}(0.01M) \parallel Ag^+(0.1M) \mid Ag$, its emf value equals .....
(A) 1.5895 V (B) 1.56 V (C) 0.00 V (D) 1.6895 V
(The standard reduction potential of $Ag|Ag^+$ half-cell is + 0.80 V and $Zn|Zn^{2+}$ is – 0.76V)

(35) A metal single electrode potential of a half-cell is independent on .....
(A) the tendency of metal to form ions (B) temperature
(C) the concentration of metal ions in the solution (D) atmospheric pressure

(36) The ..... quantum number determines the size of the orbit.
(A) principal (B) angular momentum (C) magnetic (D) spin

(37) Which of the following is the correct set of quantum numbers for the outermost electron of P atom?

(A) $n = 3, \ell = 1, m_\ell = +2, m_s = -1/2$ (B) $n = 3, \ell = 1, m_\ell = -1, m_s = +1/2$

(C) $n = 3, \ell = 1, m_\ell = -2, m_s = +1/2$ (D) $n = 3, \ell = 2, m_\ell = +1, m_s = -1/2$

(38) ..... stated that "no two electrons in an atom can have the same set of 4 quantum numbers".

(A) Bohr (B) de Broglie (C) Pauli (D) Planck

(39) The ..... molecule has an ionic bond.

(A) HCl (B) NaF (C) Cl_2 (D) both a and b

(40) The total number of electron pairs on the S atom in the SF_4 molecule is .....

(A) 1 (B) 2 (C) 4 (D) 5

(41) The NF_3 molecule has ..... double bond(s).

(A) 0 (B) 1 (C) 2 (D) 4

(42) The SO_3 molecule has ..... resonance structures.

(A) 0 (B) 2 (C) 3 (D) 4

(43) The ..... molecule has the smallest bond angle.

(A) H_2O (B) BF_3 (C) CH_4 (D) SF_6

(44) The bond angle of the trigonal planar shape is .....

(A) 90° (B) 109.5° (C) 120° (D) 180°

(45) The electron domain geometry of ClF_3 molecule is .....

(A) trigonal planar (B) octahedral (C) trigonal bipyramidal (D) tetrahedral

(46) The molecular geometry of SF_4 molecule is .....

(A) tetrahedral (B) trigonal bipyramidal (C) seesaw (D) T-shaped

(47) The hybridization of C in CO_3^{2-} ion is .....

(A) sp (B) sp^2 (C) sp^3 (D) sp^3d

(48) The bond order in He_2^+ is .....

(A) 0 (B) 0.5 (C) 1 (D) 1.5

(49) The B_2 molecule contains ..... unpaired electron(s).

(A) 0 (B) 1 (C) 2 (D) 4

(50) ..... has a bond order of 2.5

(A) O_2 (B) O_2^+ (C) O_2^- (D) O_2^{2-}

Atomic numbers: H=1, He=2, B=5, C=6, N=7, O=8, F=9, Na=11, P=15, S=16, Cl=17

Atomic weights: Hydrogen = 1; Carbon = 12; Nitrogen = 14; Oxygen =16;

$R = 0.0821$ atm L mol^{-1} K^{-1}; 8.314 J mol^{-1} K^{-1}; 1.987 Cal mol^{-1} K^{-1}.

End of Exam

Best Wishes Prof. Dr. Maher M. A. Hamed; Prof. Dr. Bahaa M. Abu-Zied

Dr. Soliman A. Soliman; Dr. Ahmed A. K. Mohammed

Δ Remember ■Understand •Apply ◊Analysis *Evaluate ◯Create

	Assiut University- Faculty of Science Frist Semester- Final Exam 2025-2026 Chemistry Department	Level : 1 Date: 28/12/2025 Time: 2 h	
Course Title: General Chemistry II			Code: 105 Chem
Instructors: Prof. Dr. Ali Abdel-Hafez & Dr. Soliman A. Soliman			
Important:	No. of pages: 3	No. Of questions 2	Total Marks: 50

يتم طمس (تسويد) الإجابة المختارة من قبل الطالب باستخدام القلم الجاف فقط

Answer the following questions:

Q1. Shade the correct answer A,B,C or D (1 Mark each)

1- The carbocation with adjacent double bond is known as:
A) Stable carbocation, B) allylic cation, C) A and B D) None.

2- The addition of HBr to 1,3-dienes is:
A) Electrophilic, B) Nucleophilic, C) Free radicals, D) None

3- Curved headed arrow is used to indicate:
A) Homolytic bond fission, B) Point of reactants to products, C) reversible reactions, D) None

4- Hydrogenation of 2-butyne in presence of lindler's catalyst consumed:
A) One mole of H_2, B) two moles of H_2, C) three moles of H_2, D) None

5- Hydration of propene gave:
A) Propane, B) propyne, C) propanal, D) None

6- CH_3CONH_2 is called: A) Methylamine, B) ethylamine, C) urea, D) None

7- CH_3SCH_3 is called:
A) Dimethylthiol, B) dimethylsulphone, C) dimethylsulphate, D) None

8- Methylformate is the isomer of:
A) Formic acid, B) formaldehyde, C) formamide, D) acetic acid

9- Many radicals are: A) Stable, B) unstable, C) high reactive, D) B and C

10- The correct order of increasing stability is:
A) $^+CH_3$, $CH_3CH_2^+$, $(CH_3)_2CH^+$, $(CH_3)_3C^+$ B) $(CH_3)_3C^+$, $(CH_3)_2CH^+$, $CH_3CH_2^+$, $^+CH_3$
C) $CH_3CH_2^+$, $^+CH_3$, $(CH_3)_2CH^+$, $(CH_3)_3C^+$ D) $(CH_3)_2CH^+$, $(CH_3)_3C^+$, $^+CH_3$, $CH_3CH_2^+$

11- Which alkenes don't have geometric isomerism:
A) 1-butene, B) 2-butene, C) 3-bromo-2-butene, D) A and C

12- The order of increasing acidity of the following: A) Propene, propyne, ethyne, ethene;
B) ethyne, propyne, ethene, propene; C) propene, ethene, propyne, ethyne; D) None

13- The correct order of increasing C-H bond length is:
A) SP^3-H, SP^2-H, SP-H, B) SP^2-H, SP^3-H, SP-H; C) SP^2-H, SP-H, SP^3-H; D) None

14- The order of increasing angle between hybrid orbitals is:
A) SP, SP^3, SP^2; B) SP^2, SP, SP^3 ; C) SP^3, SP^2, SP; D) None

15- How many isomers obtained from mono bromination of methylcyclopropane:
A) 2, B) 3, C) 4, D) 5

16- The equilibrium constant (K_{eq}) for a certain reaction will change if ..... changes.
A) pressure B) temperature C) concentration D) volume

17- The pH of 0.87 M of an aqueous H_2SO_4 solution is:

A) 0.09 B) 0.06 C) 0.12 D) 0.24

18- The molar solubility of $Mg(OH)_2$ in a buffer solution having pH=9 is: ..... (K_{sp} =1.0x10^{-11})

A) 0.1 B) 0.01 C) 1.0 D) 1x10^{-6}

19- Which of the following is a colligative property of a given solution?

A) relative lowering of viscosity B) boiling point depression

C) freezing point elevation D) lowering of vapor pressure

20- For the reaction: $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$, the value of K_p/K_c is equal to:

A) $\sqrt{RT}$ B) $(RT)^2$ C) $1/(RT)^2$ D) $1/\sqrt{RT}$

21- Which of the following 1.0 M aqueous solutions have the lowest pH value?

A) HCOOH B) HCl C) CH_3COONa D) CH_3COOH

22- If K_{sp} for $BaSO_4$ is 8.1×10^{-9}, the molar solubility of this salt is:

A) 9.0×10^{-5} B) 7×10^{-5} C) 5.0×10^{-6} D) None of these

23- If the freezing point of pure benzene is 5.4°C and that of a solution containing 2.0 g of solute per 100 g benzene is 4.4 °C. Then, the molecular weight of the solute will be:

(Molal depression constant for benzene is 5 °C /mol).

A) 0.1 B) 10 C) 100 D) 0.01

24- The pH of 0.01M CH_3COONa solution is: (K_a of CH_3COOH= 1.65 x 10^{-5})

A) 4.74 B) 7.47 C) 5.61 D) 8.39

25- If the equilibrium constant, K_c , for the gaseous reaction; $H_2 + I_2 \rightleftharpoons 2HI$ is 25 ;

the value of K_c for the reaction; $HI \rightleftharpoons \frac{1}{2}H_2 + \frac{1}{2}I_2$ is:

A) 0.20 B) 0.02 C) 0.04 M D) 0.40

26- The solubility product expression for bismuth (III) sulfide, Bi_2S_3, is:

A) $[Bi^{3+}]^3[S^{2-}]^2$ B) $[Bi^{3+}]^2[S^{2-}]^3$ C) $[Bi^{3+}][S^{2-}]$ D) $[Bi^{3+}]^2/[S^{2-}]^3$

27- The equilibrium constant K_p for the reaction: $B_{(s)} + \frac{3}{2} F_{2(g)} \rightleftharpoons BF_{3(g)}$ is 1.24 at 191°C.

What is the K_c for the same reaction at 191 °C (R = 0.082 L atm mol^{-1} K^{-1})?

A) 6.70 B) 0.61 C) 8.30 D) 7.65

28- A certain buffer solution contains equal concentrations of HA and A^- (K_a for HA is 1.25x10^{-5}).

The pH of the buffer is:

A) 4.74 B) 4.9 C) 5.30 D) 5.74

29- A solution of 1.0 g of urea (M. Wt. of urea = 60 g/mol) in 50 g of water gave a boiling point elevation of 0.2°C, the molal elevation constant of water (ΔT_b) equals:

A) 0.45 B) 0.50 C) 0.55 D) 0.60

30- If the concentration of the Ag^+ ions in a saturated solution of $Ag_2C_2O_4$ is 2.2×10^{-4} M.

The K_{sp} of $Ag_2C_2O_4$ will be:

A) 2.66×10^{-12} B) 4.5×10^{-11} C) 5.3×10^{-12} D) none of these

17- The pH of 0.87 M of an aqueous H_2SO_4 solution is:

A) 0.09 B) 0.06 C) 0.12 D) 0.24

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(Molal depression constant for benzene is 5 °C /mol).

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A) $[Bi^{3+}]^3[S^{2-}]^2$ B) $[Bi^{3+}]^2[S^{2-}]^3$ C) $[Bi^{3+}]\,[S^{2-}]$ D) $[Bi^{3+}]^2/[S^{2-}]^3$

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The pH of the buffer is:

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30- If the concentration of the Ag^+ ions in a saturated solution of $Ag_2C_2O_4$ is 2.2×10^{-4} M.

The K_{sp} of $Ag_2C_2O_4$ will be:

A) 2.66×10^{-12} B) 4.5×10^{-11} C) 5.3×10^{-12} D) none of these

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