EDUCATIONAL ASSESSMENT AND EXAMINATIONS SERVICE
CHEMISTRY PILOT TEST
HAMILE 2015 EC (JULAY 2023 GC)

BOOKLET CODE: 030 **SUBJECT CODE: 05**
Number of Item: 80 **TIME ALLOWED 1:30 HOURS**

1. Which one of the following **IS NOT** in agreement with the modern atomic theory?

   A. Atoms are known to be the smallest particles of all elements that take part in chemical reactions.
   B. The atoms of the same elements and different elements may or may not have different chemical properties.
   C. Atoms of two or more elements combine in simple whole numbers ratios to form compounds.
   D. Atoms of the same element may not be identical in mass because of the existence of isotopes.

2. If the atomic number of the element silicon is 14, what will be the number of protons and electrons, respectively?

   A. 7 and 7
   B. Zero and 14
   C. 14 and Zero
   D. 14 and 14

3. Silver has two naturally occurring isotopes with compositions: 51.84% of ^{107}Ag and 48.16% of ^{109}Ag. What will be the atomic mass of silver?

   A. 107.96
   B. 108.00
   C. 110.94
   D. 104.99

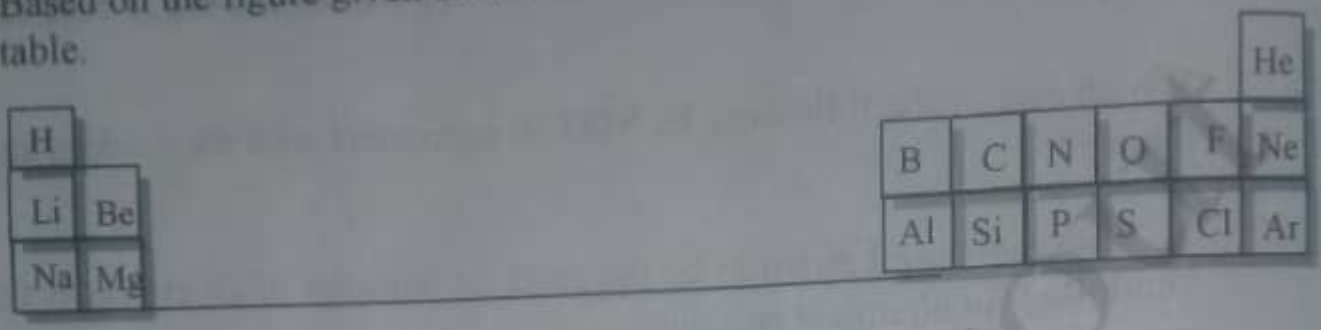
4. Which of the following best describes "group" in the modern periodic table?

   A. Elements in a given group have the same total number of electrons.
   B. Elements in the same group have similar chemical properties.
   C. Elements in a given group have the same mass number.
   D. Elements in the same group have same number of isotopes.

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5. Identify the **CORRECT** trend in increasing the first ionization energy of the elements starting from the lowest to the highest?
Based on the figure given below that shows a partial diagram of the Periodic table.



A. Li < B < Al < N < Cl
B. Li < B < N < Al < Cl
C. Li < N < B < Al < Cl
D. Li < Al < B < N < Cl

6. Among the following compounds, which one possess covalent bond?

A. Sugar
B. Salt
C. Silver
D. Silicon

7. A student investigated the solubility of $LiClO_4(s)$. Which of the following observations could be **CORRECT**?

A. $LiClO_4(s)$ is soluble in ethanol
B. $LiClO_4(s)$ is soluble in benzene
C. $LiClO_4(s)$ is insoluble in water
D. $LiClO_4(s)$ is insoluble in acetonitrile

8. To which of the following block and group respectively does the element with the electron configuration of $1s^2 2s^2 2p^6 3s^2 sp^6 4s^1$, belong?

A. s-block and Group IIA
B. s-block and Group IA
C. p-block and Group IB
D. p-block and Group IA

9. What is the law that can be best described by the statement "all samples of pure water are 11.9% (by weight) hydrogen and 88.81% (by weight) oxygen"?

A. Law of multiple proportions
B. Law of definite proportions
C. Law of compound formations
D. Law of natural compositions

10. Under which one of the following conditions is a change said to be endothermic?

A. During evolution heat
B. Upon crystallization of a liquid
C. Upon condensation of a gas
D. During absorption of heat

11. Which one of the following **DOES NOT** describe an exothermic reaction?

A. The reaction vessel cools
B. Energy is absorbed
C. Heat is released
D. ΔH is negative

12. Consider the equilibrium for the decomposition of water to hydrogen and oxygen gas:

$$2H_2O(g) \rightleftharpoons 2H_2(g) + O_2(g), \Delta H = +241.7\ kJ$$

What should be done to increase the production of hydrogen gas?

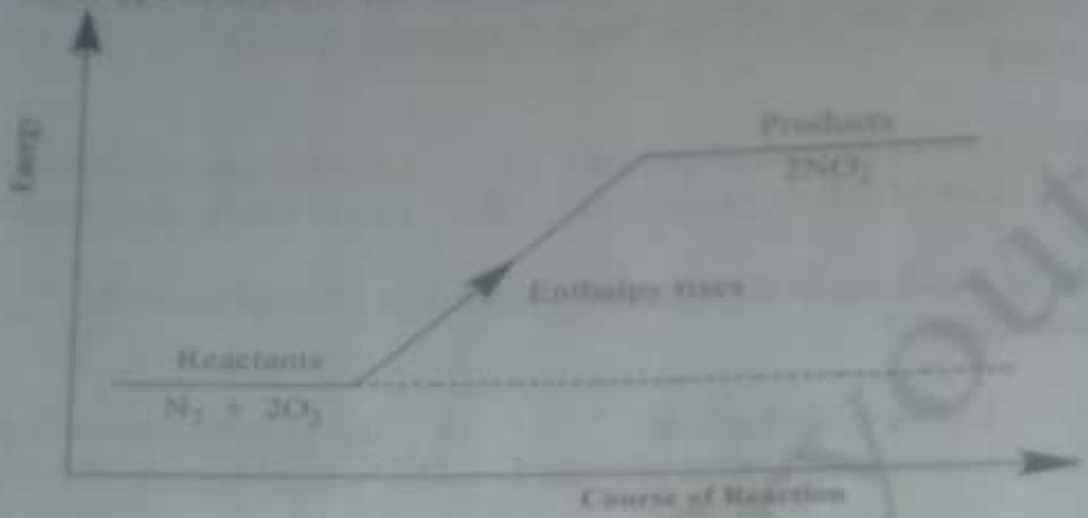
A. Decrease the total pressure
B. Decrease the temperature
C. Increase the pressure of hydrogen gas
D. Increase the pressure of oxygen gas

CHEMISTRY FORUM

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13. What type of chemical reaction is represented by the diagram given below?



A. A catalytic reaction
B. A slow reaction
C. An endothermic reaction
D. An exothermic reaction

14. Which statement below **CORRECTLY** states the oxidation number rules?

A. The oxidation number of an atom in a monoatomic ion is zero.
B. The oxidation number of fluorine is -1 in all of its compounds.
C. The oxidation number of hydrogen is +1 in all of its compounds.
D. The oxidation number of oxygen is -2 in all of its compounds.

15. The increase in the rate of a reaction by increasing temperature is **BEST** explained :

A. An increase in the surface area as the temperature is increased.
B. A decrease in the energy barrier as the temperature is increased.
C. An increase in pressure as the temperature is increased.
D. A decrease in the rate of collisions as the temperature is increased.

16. What is the mathematical equation that describes Boyle's law?

A. PV = constant for a constant amount of gas and temperature
B. VT = constant for a constant amount of gas and pressure
C. P/V = constant for a constant amount of gas and temperature
D. V/T = constant for a constant amount of gas and pressure

17. A rigid oxygen tank stored outside a building has a pressure of 20.00 atm in the morning, when the temperature is 10 °C. What will be the pressure in the tank at noon, when the temperature is 30 °C?

A. 21.4 atm
B. 60.0 atm
C. 6.7 atm
D. 18.7 atm

18. A student performed an experiment using a volume of air occupying 20.0 dm^3 at 1.0 atm pressure and constant temperature. What volume of air will he/she measure if the pressure is increased to 4.0 atm?

A. 20.0 dm^3
B. 10.0 dm^3
C. 5.0 dm^3
D. 4.0 dm^3

19. What is the general name given to hydrocarbons that contain benzene rings or similar features?

A. Saturated hydrocarbons
B. Unsaturated hydrocarbons
C. Aromatic hydrocarbons
D. Polar hydrocarbons

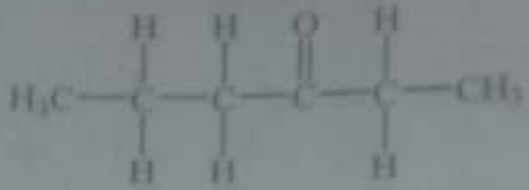
20. Among the following class of monohydric alcohols, identify the molecular formula for 1-pentanol?

A. $CH_3CH_2CH_2OH$
B. $CH_3(CH_2)_4CH_2OH$
C. $CH_3(CH_2)_3CH_2OH$
D. $CH_3(CH_2)_2CH_2OH$

21. Identify the method that requires an acidic medium in the preparation of alcohols?

A. Hydrolysis of Esters
B. Hydration of alkenes
C. Hydrolysis of alkyl halides
D. Fermentation of carbohydrates

22. What is IUPAC name for the compound with the following chemical structure?

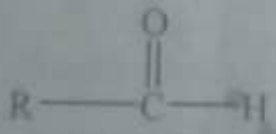


A. 3-hexanone
B. 4-hexanone
C. 3-pentanone
D. 4-pentanone

23. Identify the chemical compound that is solely used as herbicide?

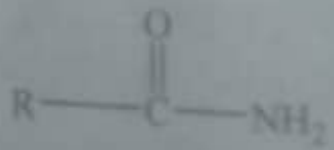
A. Paraquat
B. Malathion
C. Aldrine
D. Dieldrine

24. Which of the following gives a general structural representation of a carboxylic acid?

A. 

C 

B 

D 

25. Which one of the following is an amphoteric oxide?

A. PbO_2
B. GeO_2
C. SiO_2
D. CO_2

26. Among the following identify the one which is **NOT** a common property of acids?

A. Having a sour taste
B. Changing the colors of indicators
C. Reacting with nonmetals to produce hydrogen gas
D. Reacting with carbonates to produce carbon dioxide gas

27. According to the pH scale, the values are in the range of 0 to 14. Which statement below is **CORRECT** in this scale?

A. Strong bases are those with pH values of 13-14
B. Weak bases are those with pH values of 0-1
C. Strong acids are those with pH values 6-7
D. Strong acids are those with pH values of 13-14

28. Which one of the following is peroxide?

A. Ca_2O_2
B. H_2O_2
C. KO_2
D. H_2O

29. Among the following solutions differentiate the one that contains strong electrolyte solutions?

A. 0.5 M hydrochloric solution
B. 1.0 M ammonia solution
C. 2.0 M acetic acid solution
D. 3.0 M nitrous acid solution

30. Which one of the following resources are renewable?

A. Plants, coal, oil
B. Water, coal, natural gas
C. Plants, animals, water
D. Coal, oil, minerals

31. One of the extraction process enables obtaining the purest form of copper?

A. electrolytic refining
B. froth floatation
C. roasting chalcopyrite ore
D. smelting the roasted mixture

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32. Identify one of the techniques that **IS NOT** commonly used in food processing and preservation?

A. salting
B. canning
C. washing
D. smoking

33. For the reduction of Al_2O_3 to Al, which of the following industrial processes are used?

A. electrolytic reduction
B. flotation
C. Reduction with strong reducing agent using carbon
D. Oxidation of sulfur with Al_2O_3

34. A student visited a nearby electroplating factory which uses large quantity of hexavalent chromium. The company also released the wastewater to the nearby community. Which statement below in his/her report do you consider being an important recommendation?

A. Hexavalent chromium is important to prevent corrosion and its usage should be practiced in other sectors.
B. Hexavalent chromium is important to prevent corrosion, but its usage should be discouraged due to the toxic nature of the chemical.
C. Hexavalent chromium is important to prevent corrosion, but the wastewater must be properly treated before being discharged to the community.
D. Hexavalent chromium is important to prevent corrosion and the wastewater must be properly used in irrigation before being discharged to the community.

35. Identify the main use of skin and hide?

A. Production of pulp
B. Production of oil
C. Production of cosmetics
D. Production of leather

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36. Which one of the following is generally used for reducing water pollution?

A. Adding pesticides and herbicides into the wastewater before releasing.
B. Heating the industrial wastewater before discharging into the environment.
C. Adsorption of pollutants before discharging industrial wastewater.
D. Using the industrial wastewater for irrigation before releasing into the environment.

37. Select one among the following that **CORRECTLY** define precision or accuracy?

A. Precision or accuracy is a term used to describe of how the different measurements agree with the correct value.
B. Accuracy is a measure of how the different measurements agree with the correct value.
C. Accuracy is a measure of how the different measurements agree with each other.
D. Accuracy or precision are terms used to measure how the average value a measurement is close to the correct value.

38. A student conducted a series of titration experiment to determine the concentration of an unknown acid in the laboratory. Which one of the following skills is **NOT** demonstrated in this experiment?

A. Skills in observation
B. Skills in interpretation of data
C. Skills in safe handling of chemicals
D. Skills in the operation of instruments

39. 25 percent of a certain element X exists as ^{210}X and 75 percent of it exists as ^{214}X. What is the atomic mass of element X in amu?

A. 85
B. 211
C. 212
D. 213

40. The Aufbau's principle set the rule for filling electrons in atomic orbitals. Which of the following paraphrases the Aufbau principle?

A. The energy levels of orbitals are arranged in order of increasing their subshells.
B. Electrons occupy the lowest-energy orbitals first before filling the higher energy orbitals
C. Degenerate orbitals are each occupied by single electron before the second electron of opposite spins enter the orbital
D. No two electrons in atom can have the same value of the quantum numbers

41. What is the quantity that is obtained by taking the averages of the relative masses of the isotopes of each element, weighted by their observed fractional abundances?

A. atomic mass
B. isotopic mass
C. percent mass
D. percent abundance

42. Naturally occurring rubidium with an atomic mass of 85.468 consists of two isotopes. One of the isotopes consists of atoms having a mass of 84.912 amu; the other of 86.901 amu. What is the percent natural abundance of the heavier isotope?

A. 15%
B. 28%
C. 37%
D. 72%

43. An iron rod was measured three times. The results obtained were 15.21, 15.22 and 15.23 cm. which of the following figures indicates certainty in measurement?

A. 15.220
B. 15.20
C. 15.2
D. 15.21

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44. Which one of the following elements can be classified as inner transition element?

A. Pu
B. Pb
C. Pt
D. Po

45. Which of the following models represent the shape of nitrile ion?

A. 

C. 

B. 

D. 

46. Which statement below is correct about bond length and strength?

A. A single bond is stronger than a double bond.
B. A single bond is weaker than a double bond.
C. A single bond is shorter than a double bond.
D. A single bond is equal in length with double bond.

47. Given the reaction, $aA + bB = cC$, which of the following properly expresses the equilibrium constant, K_C, for the reaction?

A. $K = a[A]b[B]/c[C]$
B. $K = [A]^a[B]^b/[C]^c$
C. $K = c[C]/[a[A]b[B]$
D. $K = [C]^c/[A]^a[B]^b$

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48. What is the constant that represents a reaction when both the forward and reverse reaction are taking place simultaneously at equal rate?

A. Forward rate constant, k_f
B. Reverse rate constant, k_b
C. The ratio of the forward to reverse rate constant, k_f/k_b
D. The difference between the forward and reverse rate constant, $k_f - k_b$

49. What happens at the macroscopic level when a certain event is at chemical equilibrium?

A. Conversion of reactants to products and products back to reactants ceases.
B. Molecules that present in larger quantities are produced fast from those present in smaller quantities.
C. Molecules that are present in smaller quantities are produced fast from those present in larger quantities.
D. Conversion of reactants to products and the products back to reactants occurs at the same rate.

50. Given:

$2A\,(g) \rightleftharpoons B\,(g) + 2C\,(g)$ $\Delta H^{\circ} = -69$ kJ and $K_C = 1 \times 10^{-6}$

If the above reactants and products are contained in a closed vessel and the reaction system is at equilibrium, how do you increase the number of moles of B?

A. Remove some C from the system.
B. Remove some A from the system.
C. Decrease the volume of the reaction vessel.
D. Increase the temperature of the reaction system

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51. A student conducted an experiment in the laboratory to prepare acetic acid from ethanol by adding potassium permanganate. Why is potassium permanganate added?

A. For reducing ethanol
B. For oxidizing ethanol
C. For decolorizing the reaction mixture
D. For removing impurities from the reaction mixture.

52. Which process below **CORRECTLY** explains hardening of oils?

A. It is a process of converting oils to fats at high temperature and pressure.
B. It is a process of converting oils to fats at low temperature and pressure
C. It is a process of converting oils to fats at high temperature by using a catalyst.
D. It is a process of converting oils to fats at high pressure by using a catalyst.

53. Considering the interplay between kinetic and potential energy, under what conditions would the liquid state be more stable than the solid and gaseous states?

A. Kinetic energy is greater than potential energy
B. Kinetic energy is less than potential energy
C. Kinetic energy is the same as the potential energy
D. Kinetic energy is the same as the total energy

54. What is the condition that gives maximum yield of products in a chemical reaction is?

A. ideal condition
B. optimum condition
C. polarized condition
D. realized condition

55. Which statement below best describes the characteristics of a chemical reaction at equilibrium?

A. The rate of the forward reaction is equal to the rate of the reverse reaction.
B. The free energy change of the reaction is generally more negative.
C. The concentrations of reactants and products are generally equal.
D. Only the products are obtained when sufficient time is given for the reaction.

56. Which one of the following chemical formulas **CORRECTLY** applies to propanoic acid?

A. $CH_3CCOOCH_3$
B. CH_3CH_2COOH
C. CH_3CH_2COOH
D. $CH_3CH_2OCH_3$

57. Which term below is expressed as grams of solute per 100 mL?

A. Solute
B. Molality
C. Solubility
D. Molarity

58. A student carefully prepared a solution by dissolving sodium thiosulfate crystals in water exceeding the solubility limit. Slightly shaking the solution, the student found a large amount of sodium thiosulfate at the bottom of the flask. What was the type of solution the student prepared?

A. Saturated solution
B. Unsaturated solution
C. Supersaturated solution
D. Under saturated solution

59. Which one of the following statements is **CORRECT** about a saturated solution?

A. A saturated solution is in static equilibrium
B. A saturated solution is in dynamic equilibrium
C. A saturated solution is thermodynamically unstable
D. A saturated solution is thermodynamically unattainable

74. Which one of the following statement is correct regarding electrolytic and galvanic cell?

A. The reaction in electrolytic cells is spontaneous but the reaction in galvanic cell is non-spontaneous.
B. Cathode is positive and anode is negative electrode in both electrolytic and galvanic cells.
C. In electrolytic cell, electrical energy causes chemical change but in galvanic cell chemical energy is converted to electrical.
D. In both electrolytic and galvanic cells reduction takes place at anode and oxidation takes place at cathode.

75. Which one of the following metals occurs in free State?

A. Sodium
B. Gold
C. Aluminum
D. Potassium

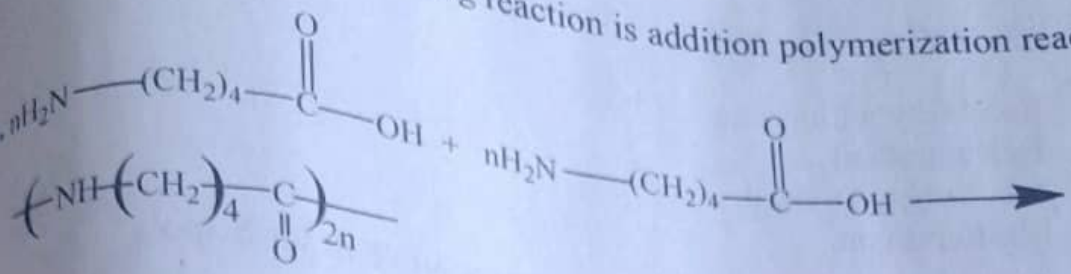
76. Which one of the following is a natural polymer?

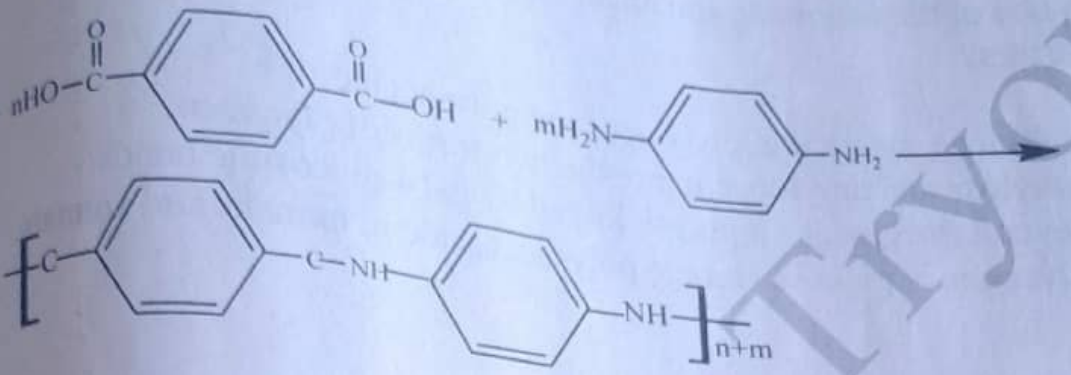
A. Teflon
B. polyester
C. protein
D. nylon

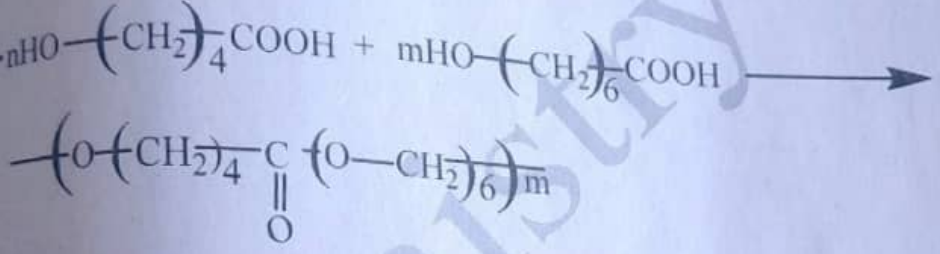
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7. Which one of the following reaction is addition polymerization reaction?

A. 

B. 

C. 

D. 

8. Which one of the following is **NOT** thermoplastic polymer?

A. Teflon
B. Dacron
C. Nylon
D. Bakelite

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79. Which properties differentiate synthetic rubber over natural rubber?

A. Solubility with organic solvent
B. Eulcanization
C. Mechanical strength
D. Elastomerism

80. Which one of the following statement **DOES NOT** describe poly saccharides?

A. cellulose, starch and glycogens are polysaccharides.
B. amylose and amylopectin are the two forms of glycogen.
C. several the glucose units are linked by β-14-glycosidic bonds.
D. glycogen is glucose storage polysaccharide in humans and animals.

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