NATIONAL EDUCATIONAL ASSESMENT AND EXAMINATIONS AGENCY (NEAEA)
ETHIOPIAN UNIVERSITY ENTRANCE EXAMINATION (EUEE)
CHEMISTRY EXAMINTION 2008

BOOKLET CODE: 00
NUMBER OF ITEMS:

SUBJECT CODE: 00
TIME ALLOWED: 00

PHYSICAL CONSTANTS:
Avogadro's No. = 6.023 x $10^{23}mol^{-1}$
Plank's constant, h = 6.626 x $10^{-34}Js^{-1}$
Rydberg's constant, R_H = 109,678 cm^{-1}
Velocity of light, c = 3 x $10^{8}ms^{-1}$
Mass of electron = 9.11 x $10^{-31}kg$
Faraday's constant (F) = 96,500 coulombs/mol
Universal gas constant, R = 8.31J/mole.K
1Cal = 4.184J
Atomic Numbers (Z) and Atomic Weights (A)

Element	H	He	Li	B	C	N	O	F	Ne	S	Cl			
Z	1	3	4	5	6	7	8	9	11	12	14	15	15	17
A	1.0	6.9	9.0	10.8	12.0	14.0	16.0	19.0	23.0	24.3	28.1	31.0	32.1	35.5

Element	Ar	Ca	Cr	Mn	Fe	Ni	Cu	Zn	As	Kr	I	xe
Z	18	20	24	25	26	28	29	30	33	36	53	54
A	39.95	40.08	52	54.9	55.9	58.71	63.5	65.4	75.0	83.8	126.9	131.3

1. A drug decomposes by zero-order kinetics with a rate constant of 2mgmL^{-1} $month^{-1}$. If the initial concentration is 100mgmL^{-1}, how long will it take for the drug to decompose by 10%?

- A. 2 months
- B. 3 months
- C. 5 months
- D. 4 months

2. The value of K_{eq} for the following reaction is 0.25.
SO_2 (g) + NO_2(g)⇆ $2SO_3$(g) + NO (g)
What is the value of Keq at the same temperature for the reaction below?
$2SO_2$ (g) + $2NO_2$ (g) ⇆ $2SO_3$ (g) + 2NO (g)

- A. 0.25
- B. 0.062
- C. 0.50
- D. 16

3. Which of the following would react to form pentyl ethanoate?

- A. 1- propanol and pentanoic acid

- B. Ethanol and pentanoic acid
- C. 1- pentanol and ethanoic acid
- D. Ethanol and ethanoic acid

4. Which of the following is correct when 34495 is rounded to three significant figures?

- A. 345
- B. 34500
- C. 344
- D. 3840

5. What is the first step of the scientific method?

- A. Making observations
- B. Forming a hypothesis
- C. Performing an experiment
- D. Predicting the result of an experiment

6. Which of the following are not electromagnetic waves?

- A. Infrared waves
- B. Gamma waves
- C. Radio waves
- D. Sound waves

7. What is the distance that a radio wave will travel in 0.250sec?

- A. 1.2×10^7m
- B. 12×10^7m
- C. 7.5×10^7m
- D. 5.6×10^7m

8. Which of the following is not a form of chemical bonding?

- A. Covalent bonding
- B. Metallic bonding
- C. Ionic bonding
- D. Hydrogen bonding

9. Which of the following statements is not true about covalent bonding?

- A. Covalent compounds are least likely to be formed between atoms of the same elements.
- B. Covalent bonds are least likely to be formed between atoms of different elements of different elements on the right slide of the periodic table.
- C. Covalent bonds are least likely to be formed between an element in Group I and an element in Group VII.
- D. Covalent bonds are least likely to be formed by head of the group elements with high ionization energies.

10. If we increase the concentration of a reactant, what happens to the collision between particles?

- A. There are more collisions.
- B. There are fewer collisions.
- C. There are the same number of collisions, but they have less energy
- D. There are the same number of collisions, but they have more energy

11. How many moles of NH_4Cl must be added to 1.5L of 0.2M solution of NH_3 to form a buffer whose PH is 9.0 ($K_b = 1.8 \times 10^{-5}$)?

- A. 0.36
- B. 0.65
- C. 0.54
- D. 0.45

12. What mass of magnesium is plated out upon electrolysis from molten $MgCl_2$ using a current of 60A for a period of 4000 seconds?

- A. 30gm
- B. 24gm
- C. 60gm
- D. 72gm

13. For a voltaic (or galvanic) cell using Ag, Ag^+ (1.0m) and Zn, Zn^{2+} (1.0m) half cells, which of the following statements is incorrect?

- A. The zinc electrode is the Anode.
- B. The electrons will flow through the external circuit from the zinc electrode to the silver electrode.
- C. The mass of the zinc electrode will decreases as the cell operates.
- D. Reduction occurs at the zinc electrode as the cell operates.

14. The difference between fats and oils is that

- A. Oils are liquid at room temperature.
- B. Oils have more calories
- C. Oils are sold at room temperature.
- D. Fats are liquid at room temperature.

15. What kind of solution forms when gasoline evaporates in air?

- A. Gas in gas solution
- B. Gas in liquid solution
- C. Liquid in liquid solution
- D. Liquid in gas solution

16. What is the solvent in 70% alcohol solution?

- A. Water
- B. Alcohol
- C. Sugar
- D. Kerosene

17. How many moles of H_2SO_4 are needed to prepare 5.0 liters of a 2.0M solution of H_2SO_4?

- A. 2.5
- B. 5
- C. 20
- D. 10

18. What is the balanced net ionic equation for the reaction of $CaCl_2$ and $AgNO_3$?

- A. $CaCl_2$ (aq) + $2AgNO_3$ (aq) → $2(NO_3)2$ (aq) + 2AgCl (s)
- B. Ca^{2+} (aq) + $2Cl^-$ (aq) + $2NO_3^-$ (aq) → Ca^{2+} (aq) + $2NO_3^-$ + 2AgCl (s)
- C. Cl^- (aq) + Ag^+ (aq) → 2AgCl (s)
- D. $2Cl^-$ (aq) + $2Ag^+$ (aq) → 2AgCl (s)

19. The K_a of Hypochlorous acid (HClO) is 3.0 x 10^{-4} at 25^0C. What is the % ionization of hypochlorous acid in a 0.015M aqueous solution of HClO at 25^0C?

- A. 2.1 x 10^{-5}
- B. 0.14
- C. 1.4 x 10^{-3}
- D. 3.3 x 10^{-3}

20. Which of the following combinations cannot produce a buffer solution?

- A. $HClO_4$ and $NaClO_4$
- B. HCN and NaCN
- C. HNO_2 and $NaNO_2$
- D. NH_3 and $(NH_4)2SO_4$

21. What is the molality of a solution that contains 51.2gm of naphthalene, $C_{10}H_8$ in 500ml of carbon tetrachloride? The density of CCl_4 is 1.60gm/ml

- A. 0.750m
- B. 0.500m
- C. 0.84m
- D. 1.69m

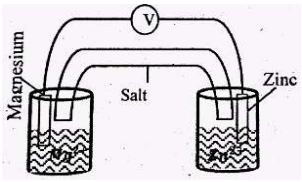
22. What is the ionization constant for a weak acid, Ha, that is 1.60% ionized in 0.0950M solution?

- A. 2.69 x 10^{-3}
- B. 3.77 x 10^{-2}
- C. 2.47 x 10^{-5}
- D. 9.91 x 10^{-6}

23. Which of the following is correct?

- A. 1pa = $10Nm^2$
- B. 1N = 10Kg
- C. 0.00072 = 7.2 x 10^{-3}
- D. 1L = $1dm^3$

24. For the Galvanic cell shown below, which one of the following statement is correct?



- A. At the zinc electrode, zinc ions are formed.
- B. The electrode potential is measured by the voltmeter.
- C. The following reaction takes place at the magnesium electrode $Mg^{2+} + 2e^- \rightarrow Mg$.
- D. Electrons flow from the zinc electrode to the magnesium electrode.

25. What is the most common Ore used for the extraction of copper?

- A. CuO
- B. $CuSO_4$
- C. $CuCO_3$
- D. $CuFeS_2$

26. Which of the following materials has the maximum ductility?

- A. Nickel
- B. Aluminium
- C. Mild steel
- D. Copper

27. Which of the following statements about polyvinyl chloride is not correct?

- A. Pvc can be used in making water pipes
- B. Pvc is stiff
- C. Pvc is softened on heating
- D. The mnomer of Pvc is CHCl = CHCl

28. Which of the following is a natural polymer?

- A. Keratin
- B. Polythene
- C. Cellulose
- D. Polymethyl methacrylate

29. Which of the following does not affect the solubility of a gas dissolved in a liquid?

- A. Nature of solute and solvent
- B. Pressure
- C. Temperature
- D. Rate at which the gas dissolves

30. When a small amount of crystal solute is added to the super saturated solution, the solute crystals will

- A. Grow bigger
- B. Slightly dissolve
- C. Remain unchanged
- D. Dissolved completely

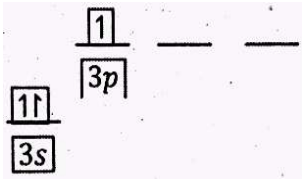
31. Which of the following electrons, identified only by their n and l quantum numbers have the highest energy?
n=3, l=0 n=4,l=1 n=3, l=2 n=4, l=2

- A. n = 3, l = 2
- B. n = 4, l = 1
- C. n = 4, l = 2
- D. n = 3, l = 0

32. What is the maximum number of unpaired electron in a d subshell?

- A. 2
- B. 5
- C. 3
- D. 4

33. The following energy level diagram represents the out most shell of what ground state element?



- A. B
- B. He
- C. Al
- D. Be

34. Which of the following represents a tentative explanation of a certain scientific law?

- A. Hypothesis
- B. Observation
- C. Explanation
- D. Theory

35. In order to advance the level of a theory, a hypothesis should:

- A. Be obviously accepted by most people.
- B. Be repeatedly confirmed by experimentation.
- C. Be a fully functional experiment.
- D. Report the past experience.

36. Which of the following types of rays combine to form atoms of Helium?

- A. Gamma (γ) rays
- B. Beta (β)
- C. Alpha (α)
- D. X-rays

37. What is the relationship between frequency (V), wavelength (λ) and the speed of light (c)?

- A. $\lambda/v = c$
- B. $vc = \lambda$
- C. $hc/\lambda = v$
- D. $c = v\lambda$

38. What is the magnitude of quantum energy and the frequency for an object whose wave length is 0.6 x 10^{-6}m?

- A. 3.31 x 10^{-9}J, 5 x $10^{14}s^{-1}$
- B. 3.98 x 10^{-40}J, 2 x $10^{-15}s^{-1}$
- C. 1.99 x 10^{-25}J, 3.98 x $10^{-40}s^{-1}$
- D. 9.94 x 10^{-12}J, 1.99 x 10^{-25} sec

39. What new concept did Bohr adapt and use to formulate his made of the atom?

- A. Electromagnetic theory developed by Maxwell.
- B. The quantum concept developed by plank
- C. Phoelectric theory developed by Thompson
- D. Newtron theory developed by Chadwick.

40. What values of l are permitted for an electron with n = 4?

- A. 1, 2, 3

- B. 1, 2, 3, 4
- C. 0, 1, 2, 3, 4
- D. 0, 1, 2, 3

41. What would happen to the oxygen molecule upon ionization to O_2^+?

- A. The bond length will increase and the bond energy will increase.
- B. The bond length will increase and the bond energy will decrease.
- C. The bond length will decrease and the bond energy will increase.
- D. The bond length will decrease and the bond energy will decrease.

42. For a first order reaction, a plot of _____ versus _____ is linear.

- A. $1/[A]_t$, t
- B. Ln $1/[A]_t$, t
- C. $[A]_t$, t
- D. ln $[A]_t$, t

43. The rate law of the overall reaction A + B → C is rate = K $[A]^2$ which of the following will not increase the rate of the reaction?

- A. Increasing the concentration of reactant A.
- B. Increasing the concentration of reactant B.
- C. Increasing the temperature of the reaction.
- D. Adding a catalyst for the reaction.

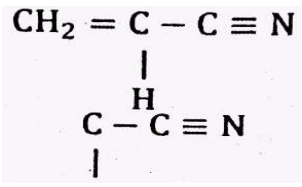
44. How many bonding pairs and lone pairs, respectively does the ion ICl_4^- have?

- A. 3, 2
- B. 4, 2
- C. 5, 1
- D. 4, 1

45. Which of the following molecule does not have a tetrahedral central atom?

- A. SF_4
- B. AlH_4^-
- C. BF_4^-
- D. $SiCl_4$

46. Acrylonitrile has the following Lewis structure with the designation of x, y and z for each carbon atom. What will be the value of the bond angle and geometry of



- A. 1090, tetrahedral
- B. 1200, trigonal pyramidal
- C. 1800, linear
- D. 900, T- shape

47. Antimony (Sb) is a group v element, what will be the molecular geometry and number of lone pair electrons, respectively that exists in the ion $[SbCl_5]^{2-}$?

- A. Seesaw, 1
- B. Square payramid, 2
- C. Seesaw, 2
- D. Linear, 3

48. Which of the following molecules does not have a trigonal bipyramidal electron-pair geometry?

- A. SF_4
- B. ClF_3
- C. XeF_2
- D. BrF_5

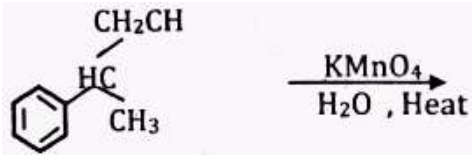
49. How many atomic orbitals are required for an sp^3 hybridization?

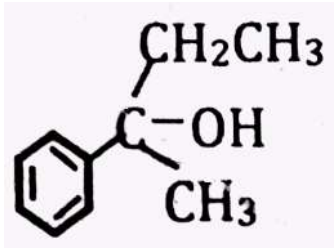
- A. 2
- B. 6
- C. 4
- D. 8

50. Formic acid, which is released by ants, has a molecular formula of HCOOH. What are the possible hybridizations that exist in the molecule?

- A. Sp^2 and sp^3
- B. Sp and sp^3
- C. Sp, sp^2 and sp^3
- D. Sp and sp^2

51. Consider the following reaction: What will be the main product of the reaction above?



A.


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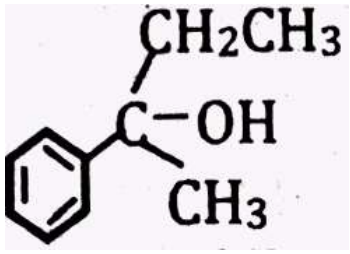
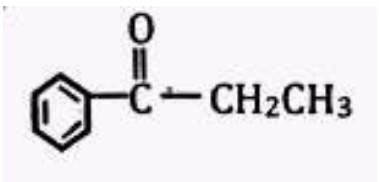
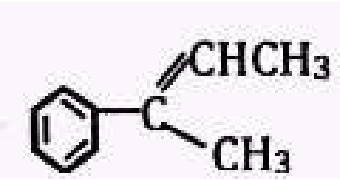


C.


D. 

52. Which of the following statements concerning the carbonyl group in aldehydes and ketones is not true?

A. The bond is polar, with a slight negative charge on the oxygen atom.

B. The bond angles about the central carbon atom are 120^0.

C. In condensed form, the carbonyl group can be written as CHO.

D. The bond is polar. Therefore, carbonyl groups readily form hydrogen bonds with each other.

53. Which of the following statements concerning fats and oils is incorrect?

A. They are also called triacylglycerols.

B. They are also called triglycerides.

C. They are fatty acid salts.

D. They are glycerol trimesters.

54. Which of the following statement(s) is (are) applicable to a balanced chemical equation of an elementary reaction?
I. Order is same as molecularity.
II. Order is less than the molecularity.
III. Order is greater than the molecularity.
IV. Molecularity can never be zero.

A. I

B. I, II

C. I, IV

D. I, III

55. At high pressure, the following reaction is zero order, Which of the following options is (are) correct for this reaction?
I. Rate of reaction = rate constant.
II. Rate of reaction depends on the concentration of ammonia.
III. Rate of decomposition of ammonia remains constant until ammonia decomposes completely.
IV. Further increase in pressure will change the rate is reaction.

$$2NH_{3(g)} \xrightarrow{1130\ K,pt} N_{2(g)} + 3H_{2(g)}$$

A. I

B. I, III, IV

C. I, II

D. I, II, IV

56. Which of the following expressions is correct for the rate of reaction given below?

$5Br^-(aq) + BrO^-_3 + 6H^+(aq) \rightarrow 3Br_2(aq) + 3H_2O(l)$

A. $\frac{\Delta[Br]}{\Delta t} = \frac{5[\Delta H]}{\Delta t}$

B. $\frac{\Delta[Br]}{\Delta t} = 5/6\frac{\Delta H}{\Delta t}$

C. $\frac{\Delta[Br]}{\Delta t} = 6/5\frac{\Delta H}{\Delta t}$

D. $\frac{\Delta[Br]}{\Delta t} = 6\frac{\Delta H}{\Delta t}$

57. Rate law for the reaction A + 2B → C is found to be
Rate = k[A][B]
If the concentration of reactant 'B' is doubled, keeping the concentration of 'A' constant, what will be the value of the rate constant?

- A. The same
- B. Halved
- C. Quadrupled
- D. Doubled

58. The following equilibrium constants were determined at 300^0C.
$2N_2O$ (g) ⇄ N_2 (g) + O_2 (g), $K_c = 4.0 \times 10^{18}$
N_2 (g) + O_2 (g) ⇄ 2NO (g), $K_c = 4.0 \times 10^{-31}$
What will be the equilibrium constant at 300^0C for the gaseous reaction of $2N_2O$ (g) + O_2 (g) ⇄ 4NO (g)?

- A. 3.2×10^{-12}
- B. 6.4×10^{45}
- C. 5.0×10^{50}
- D. 1.6×10^{-49}

59. When 0.50 mol of N_2O_4 is placed in a 4.0 liter reaction vessel and heated to 400k, 80% of the N_2O_4 decomposes to NO_2 gas as follows:
N_2O_4 (g) ⇄ $2NO_2$ (g)
What will be the value of K_p, in units of pressure, at 400k for this reaction?

- A. 2.62
- B. 13.12
- C. 50.48
- D. 16.2

60. Which of the following is not true about carbonyl compounds?

- A. Carbonyl compounds contain 3σ - bond and 1π - bond.
- B. The carbon oxygen bond is both longer and weaker.
- C. The bond angle in carbonyl is about 120^0.
- D. Carbonyl compounds may be hydrolysed.

61. Sodium acetate spontaneously crystallizes out of a supersaturated solution on standing. Which of the following is true for the thermodynamic quantities of this system for such a process?

- A. $\Delta S < 0, \Delta H < 0$
- B. $\Delta G < 0, \Delta H > 0$
- C. $\Delta S > 0, \Delta G < 0$
- D. $\Delta S > 0, \Delta H > 0$

62. In which of the following systems will the position of equilibrium shift to the left upon an increase in pressure, but to the right upon an increase in temperature?

- A. CO_2 (g) + H_2 (g) ⇄ CO (g) + H_2O (g), $\Delta H > 0$.
- B. C_2H_4 (g) + H_2O (g) ⇄ C_2H_5OH (g), $\Delta H < 0$.
- C. C_2H_6 (g) ⇄ C_2H_4 (g) + H_2 (g), $\Delta H > 0$.
- D. $2SO_2$ (g) + O_2 (g) ⇄ $2SO_3$ (g), $\Delta H > 0$.

63. The hydrogen used in the Haber process is made by the following reaction
CH_4 (g) + H_2O (g) ⇄ CO (g) + $3H_2$ (g), ΔH^0 = +206KJ
Which of the following sets of conditions will favour the formation of H_2?

- A. Low pressure and high temperature.
- B. Low pressure and low temperature.
- C. High pressure and low temperature.
- D. High pressure and high temperature.

64. Which of the following types of compounds are expected products from the saponification of a fat?

- A. Glycerol and fatty acid salts.
- B. Glycerol and fatty acids.
- C. Fatty acid salts and fatty acids.
- D. Glycerol, fatty acid salts and fatty acids.

65. Which one of the following statements best describes the standard enthalpy of formation of any element?

- A. The value of ΔH_f^0 (element) depends on temperature.
- B. The value of ΔH_f^0 (element) is zero for any element in the standard sate.
- C. The value of ΔH_f^0 (element) is zero only for elements in the solid state.
- D. The value of ΔH_f^0 (element) is zero only at absolute zero temperature.

66. Equal masses of He and Ne are placed in a sealed container. What is the partial pressure of Ne, if the total pressure is 6 atm?

- A. 2
- B. 3
- C. 1
- D. 5

67. What is the molarity of a solution made by dissolving 10g of glucose ($C_2H_{12}O_6$) in sufficient water to form 200ml solution?

- A. 0.18
- B. 0.251
- C. 0.362
- D. 0.278

68. In which direction will the following equilibrium shift, if a solution of CH_3CO_2Na is added?
CH_3COOH (aq) ⇄ $CH_3CO_2^-$ (aq) + H^+ (aq)

- A. The equilibrium shift to the right (more products).
- B. No change
- C. The equilibrium shifts to the left (more resultant)
- D. Cannot be predicted.

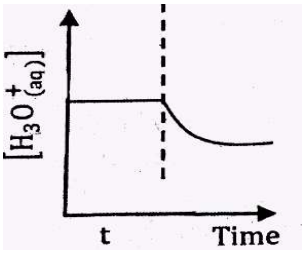
69. A 1.0M solution a weak acid is found to dissociate by only 1.37%. Which of the following acid is it likely to be?

- A. HF $K_a = 7.2 \times 10^{-4}$
- B. HNO_2 $K_a = 7.2 \times 10^{-4}$
- C. CH_3COOH $K_a = 1.8 \times 10^{-5}$
- D. HCOOH $K_a = 1.9 \times 10^{-4}$

70. Consider the following graph, which relates to the equilibrium system:

$CH_3COOH_{(aq)} + H_2O \rightleftarrows CH_3COO^-_{(aq)} + H_3O^+_{(aq)}$, $\Delta H < 0$

Which of the following actions caused the change in the concentration of $[H_3O^+_{(aq)}]$ at time t?



- A. Addition of CH_3COO^- (aq)
- B. Addition of HCl
- C. Decreasing of temperature.
- D. Increasing the volume of the container.

71. A 1.0×10^{-4}M solution has a PH of 10.00. The solution is a

- A. Weak acid
- B. Weak base
- C. Strong base
- D. Strong acid

72. The four most abundant metals in the earth's crust decreasing order of abundance are:

- A. Oxygen, Silicon, Aluminium and Iron.
- B. Aluminium, Iron, Calcium and Magnesium.
- C. Iron, Aluminium, Silicon and Oxygen.
- D. Silicon, Aluminium, magnesium and Sodium.

73. A polysaccharide is a polymer made up of which kind of monomers?

- A. Amino acids
- B. Nucleotides
- C. Simple sugars
- D. Alternating sugar and phosphate groups.

74. What is the molar solubility of $Fe(OH)_3$ in a solution that is buffered at PH = 3.50 at 25^0C? K_{sp} ($Fe(OH)_3 = 4 \times 10^{-38}$)

- A. 4.0×10^{-65}
- B. 1.1×10^{-6}
- C. 2.0×10^{-6}
- D. 1.26×10^{-6}

75. What is the purpose of a salt bridge in an electrochemical cell?

- A. To provide a source of ions to react at the anode and cathode.
- B. The maintain electrical neutrality in the half-cell through migration of ions.
- C. To provide means of electrons to travel from the cathode to the anode.
- D. To provide means of electrons to travel from the anode to the cathode.

76. What is galvanized iron?

- A. Iron that is coated with tin.
- B. Iron that is coated with zinc.

- C. Iron that is coated with chromium.
- D. Iron that is coated with aluminium.

77. The standard cell potential (E^0) for the reaction below is 1.10v. What is the cell potential for this reaction when $[Cu^{2+}] = 1 \times 10^{-5}M$ and $[Zn^{2+}] = 1M$?

$Zn_{(s)} + Cu^{2+}_{(aq)} \rightarrow Zn^{2+}_{(aq)} + Cu_{(s)}$

- A. 1.1
- B. 0.95
- C. 1.2
- D. 1.35

78. Which of the following statements is true?

- A. The more positive the value of E_{red}^0 , the greater the driving force for reduction.
- B. The more exothermic the value of E_{red}^0 , the greater the driving force for reduction.
- C. The more endothermic the value of E_{red}^0 , the greater the driving force for reduction.
- D. The more negative the value ofE_{red}^0 , the greater the driving force for reduction.

79. Which of the following types of elements are good oxidizing agents?

- A. Alkali metals
- B. Halogens
- C. Lanthanides
- D. Transition elements

80. Which of the following statements concerning petroleum is Not correct?

- A. It is a renewable energy source.
- B. It is a fossil fuel.
- C. It is a mixture consisting mainly of hydrocarbons.
- D. It was formed from marine organisms, which died millions of years ago.

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