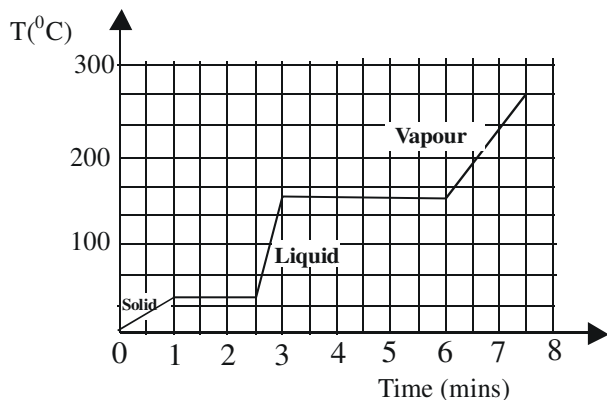


UTME 2001 Type R Questions

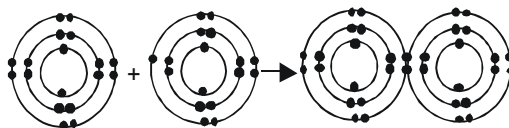
Use the graph below to answer questions 1 and 2.



- If the gas is cooled, at what temperature will it start to condense?
(A) 125°C (B) 150°C (C) 175°C (D) 250°C
- How long does it take all the solid to melt?
(A) 2.5 mins (B) 6.0 mins
(C) 1.0 mins (D) 3.0 mins
- 25cm³ of a gas X contains Z molecules at 15°C and 75mmHg. How many molecules will 25cm³ of another gas Y contain at the same temperature and pressure?
(A) 2Y (B) 2Z (C) Z (D) Y
- What mass of water is produced when 8.0g of hydrogen reacts with excess oxygen?
(A) 36.0g (B) 8.0g (C) 72.0g (D) 16.0g
[H = 1, O = 16]
- A particle that contains 9 protons, 10 neutrons and 10 electrons is a
(A) negative ion (B) positive ion
(C) neutral atom of a non metal
(D) neutral atom of a metal

- Cancerous growth are cured by exposure to
(A) γ -rays (B) β -rays
(C) α -rays (D) x-rays
- An oxide XO₂ has a vapour density of 32. What is the atomic mass of X
(A) 32 (B) 20 (C) 14 (D) 12
[O = 16]
- Milikan's contribution to the development of atomic theory is the determination of
(A) charge on electron
(B) positive rays
(C) charge to mass ratio
(D) cathode rays
- Four elements W, X, Y, and Z have atomic numbers 2, 6, 16 and 20 respectively. Which of these elements is a metal?
(A) X (B) W (C) Z (D) Y
- An element X with relative atomic mass 16.2 contains two isotopes $^{16}_8\text{X}$ with relative abundance of 90% and ^m_8X with relative abundance of 10%. The value of m is
(A) 16 (B) 18 (C) 12 (D) 14

11.

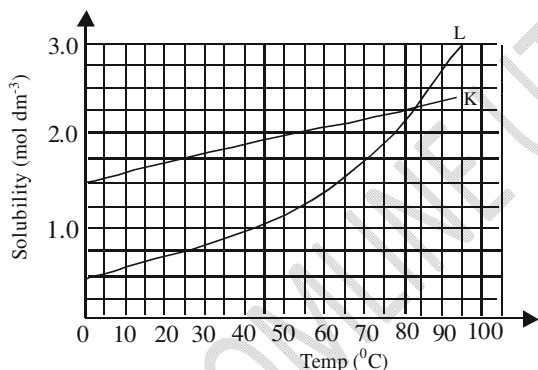


The diagram above represents the formation of

- a metallic bond
 - an electrovalent bond
 - a covalent bond
 - a coordinate bond
12. Which of the following statement is correct about the average kinetic energy of the molecules of a gas?

- (A) It increases with increase in pressure
 (B) It increases at constant pressure
 (C) It increases with increase in temperature
 (D) It increase with increase in volume
13. The pollutant from petroleum spillage in rivers and lakes can best be dispersed by
 (A) pouring detergents
 (B) passing of ships through the area
 (C) pouring organic solvents
 (D) evaporation
14. Deliquescent substances are used for
 (A) cooling (B) wetting
 (C) melting (D) drying

Use the curves below to answer questions 15 and 16.



15. If 1dm³ of saturated solution of L at 60°C is cooled to 25°C what amount in mole will separate out?
 (A) 0.75 (B) 0.25 (C) 1.00 (D) 0.50
16. At what temperature are the solubility of L and K the same?
 (A) 82°C (B) 75°C (C) 100°C (D) 90°C
17. Pure solvents are obtained by
 (A) distillation (B) condensation

- (C) extraction (D) evaporation
18. What is the decrease in volume of air when pyrogallol is shaken with 30.00cm³ of air?
 (A) 15.00cm³ (B) 6.00cm³
 (C) 0.63cm³ (D) 0.06cm³
19. Environmental pollution is worsened by the release from automobile exhausts of
 (A) water vapour (B) steam
 (C) smoke (D) heavy metals
20. The chemical used for coagulation in water purification is
 (A) aluminium tetraoxosulphate(VI)
 (B) copper tetraoxosulphate(VI)
 (C) sodium tetraoxosulphate(VI)
 (D) calcium tetraoxosulphate(VI)
21. Phosphorus is stored under water to prevent it from
 (A) dehydrating (B) becoming inert
 (C) smelling (D) catching fire
22. In which of the following reactions does reduction takes place
 (A) $\text{Fe}^{2+} - e^- \rightarrow \text{Fe}^{3+}$
 (B) $2\text{O}^{2-} \rightarrow \text{O}_2 + 4e^-$
 (C) $\text{Cr} - 2e^- \rightarrow \text{Cr}^{2+}$
 (D) $2\text{H}^+ + 2e^- \rightarrow \text{H}_2$
23. $\text{P}_{(g)} + \text{Q}_{(g)} \rightleftharpoons 3\text{R}_{(s)} + \text{S}_{(g)}$; ΔH is negative
 Which of the following will increase the yield of R?
 (A) Using a large closed vessel
 (B) Increasing the temperature
 (C) Removing some S
 (D) Adding a positive catalyst
24. A metal M displaces zinc from zinc chloride solution. This shows that
 (A) M is more electronegative than zinc
 (B) zinc is above hydrogen in the series
 (C) M is more electropositive than zinc
 (D) electrons flow from zinc to M

25. Which of the following best explains the increase in the rate of a chemical reaction as the temperature rises?
- (A) The bonds, in the reacting molecules are more readily broken
 (B) The molecular collisions becomes more violent
 (C) A lower proportion of the molecules has the necessary minimum energy to react
 (D) The collision frequency of the molecules increases
26. What current in amperes will deposit 2.7g of aluminium in 2 hours?
- (A) 32 (B) 8 (C) 4 (D) 16
27. Ethanoic acid is
- (A) tribasic (B) unionizeable
 (C) monobasic (D) dibasic
28. $C_{(s)} + 2S_{2(g)} \rightarrow CS_{2(g)} \quad \Delta H = +89kJmol^{-1}$
 The chemical equation above implies that
- (A) each of carbon and sulphur has 89kJ of energy
 (B) both carbon and sulphur contribute 89kJ of energy
 (C) 89kJ energy is released
 (D) 89kJ is absorbed
29. $2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}$
 The equilibrium constant for the reaction above is increase by
- (A) increasing the temperature of the system
 (B) increasing the pressure of the system
 (C) the addition of a catalyst to the system
 (D) increasing the surface area of the vessel
30. $3Cu_{(s)} + 9HNO_{3(aq)} \rightarrow 3Cu(NO_3)_{2(aq)} + 4H_2O_{(l)} + 2NO_{(g)}$
- In the equation above, copper is
- (A) an electron acceptor
 (B) a base
 (C) an oxidizing agent
 (D) a reducing agent
31. When ΔH is negative, a reaction is said to be
- (A) ionic (B) reversible
 (C) exothermic (D) endothermic
32. As the concentration of an electrolyte reduces, the conductivity
- (A) reduces to zero (B) decreases
 (C) increases (D) is unaffected
33. In which of the following reaction has the oxidation number of nitrogen increased?
- (A) $2NO_{(g)} + Br_{2(l)} \rightarrow 2NOBr_{(l)}$
 (B) $2NO_{2(g)} + O_{2(g)} \rightarrow 2NO_{2(g)}$
 (C) $FeSO_{4(aq)} + NO_{(g)} \rightarrow Fe(NO)SO_{4(s)}$
 (D) $2NO_{(g)} + Cl_{2(g)} \rightarrow 2NOCl_{(l)}$
34. $NH_{3(g)} + HCl_{(g)} \rightarrow NH_4Cl_{(s)}$ the entropy change in the system above is
- (A) negative (B) indeterminate
 (C) positive (D) zero
35. Fermentation is the
- (A) breaking down of carbohydrate to glucose
 (B) conversion of sugar to alcohol in the presence of yeast
 (C) breaking down of sugar to carbohydrate
 (D) conversion of alcohol to sugar in the presence of yeast
36. The general formula for the alkanals is
- (A) ROH (B) R_2CO
 (C) $RCOOR'$ (D) RCHO
37. The main impurity in iron ore during the extraction of iron is
- (A) silicon(IV) oxide
 (B) carbo (IV) oxide

- (C) calcium trioxosilicate
(D) sulphur(II) oxide
38. During the vulcanization of rubber, sulphur is added to
(A) break down rubber polymer
(B) lengthen the chain of rubber
(C) bind rubber molecules together
(D) act as catalyst
39. Catalytic hydrogenation of benzene produces
(A) oil (B) cyclohexane
(C) cyclohexane (D) margarine
40. A trihydric alkanol is
(A) glycerol (B) phenol
(C) glycol (D) ethanol
41. When chlorine is passed into water and the resulting solution exposed to sunlight, the product formed are
(A) chlorine gas and hydrogen
(B) oxygen and oxochlorate(I) acid
(C) chlorine gas and oxochlorate(I) acid
(D) hydrochloric acid and oxygen
42. Proteins in acid solution undergo
(A) polymerization (B) substitution
(C) fermentation (D) hydrolysis
43. A characteristic reaction of the compounds with the general formula C_nH_{2n} is
(A) esterification (B) polymerization
(C) decarboxylation (D) substitution
44. The pair of organic compounds that are isomers is
(A) benzene and methylbenzene
(B) trichloromethane and tetrachloromethane
(C) ethanol and propanone
(D) but-1-ene and but-2-ene.
45. A burning candle produces water and
(A) carbon(II) oxide (B) carbon(IV) oxide
(C) oxygen (D) hydrogen
46. The gas that can best be collected by down ward displacement of air is
(A) chlorine (B) sulphur(IV) oxide
(C) ammonia (D) carbon(IV) oxide
47. Which of the following metals burns with a brick-red flame?
(A) Pb (B) Ca (C) Na (D) Mg
48. Which of the following represents hybridization in ethyne?
(A) sp^2 (B) sp^2d (C) sp^3 (D) sp
49. $C_{12}H_{22}O_{11(s)} + H_2SO_{4(aq)}$
↓
 $12C_{(s)} + 11H_2SO_{4(aq)}$
In the reaction above, tetraoxosulphate(VI) acid functions as
(A) a dehydrating agent
(B) an oxidizing agent
(C) a reducing agent
(D) a catalyst
50. When sodium reacts with water, the resulting solution is
(A) weakly acidic (B) neutral
(C) acidic (D) alkaline

UTME 2001 Answers

- Option B.
- Option D.
- Option C.
- Option C.
- Option A.
- Option A.
- Option A.
- Option A.
- Option C.
- Option B.
- Option C.
- Option C.
- Option A.
- Option D.

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15. Option B.
 16. Option A.
 17. Option A.
 18. Option B.
 19. Option D.
 20. Option A.
 21. Option D.
 22. Option D.
 23. Option C.
 24. Option C.
 25. Option D.
 26. Option C.
 27. Option C.
 28. Option D.
 29. Option B.
 30. Option D.
 31. Option C.
 32. Option C.
 33. Option B.
 34. Option A.
 35. Option B.
 36. Option D.
 37. Option A.
 38. Option C.
 39. Option C.
 40. Option A.
 41. Option D.
 42. Option D.
 43. Option B.
 44. Option D.
 45. Option B.
 46. Option C.
 47. Option B.
 48. Option D.
 49. Option A.
 50. Option D.

UTME 2002

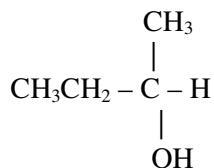
Questions: Type K

1. Which of the following gases contains the least number of atoms at s.t.p?
(A) 4 moles of chlorine
(B) 3 moles of ozone
(C) 1 mole of butane
(D) 7 moles of argon
2. A compound contains 31.91% potassium, 28.93% chlorine and the rest oxygen. What is the chemical formula of the compound?
(A) $KClO_3$ (B) $KClO_4$
(C) $KClO$ (D) $KClO_2$
[K = 39, Cl = 35.5, O = 16]
3. The formula CH_2O for ethanoic acid is regarded as its
(A) general formula
(B) structural formula
(C) molecular formula
(D) empirical formula
4. A little quantity of trichloromethane (b.pt. $60^\circ C$) was added to a large quantity of ethanol (b.pt. $78^\circ C$). The most probable boiling points of the resultant mixture is from
(A) $60^\circ C - 70^\circ C$ (B) $82^\circ C - 84^\circ C$
(C) $60^\circ C - 78^\circ C$ (D) $70^\circ C - 74^\circ C$
5. The chromatography separation of ink is based on the ability of the components to
(A) react with each other
(B) react with the solvent
(C) dissolve in each other in the column
(D) move at different speeds in the column
6. Steam changes the colour of anhydrous cobalt(II) chloride from
(A) white or red (B) blue to white
(C) white to green (D) blue to pink

-
7. Which of the following solutions containing only hydroxyl ions will liberate hydrogen gas when reacted with magnesium metals?
- (A) $1.0 \times 10^{-2} \text{ mol dm}^{-3}$
(B) $1.0 \times 10^{-4} \text{ mol dm}^{-3}$
(C) $1.0 \times 10^{-6} \text{ mol dm}^{-3}$
(D) $1.0 \times 10^{-12} \text{ mol dm}^{-3}$
8. The substance least considered as a source of environmental pollution is
- (A) silicate minerals
(B) uranium
(C) lead compounds
(D) organo-phosphorus compounds
9. The property which makes alcohol soluble in water is the
- (A) hydrogen bonding
(B) covalent nature
(C) ionic character (D) boiling point
10. The furring of kettles is caused by the presence in water of
- (A) calcium trioxocarbonate(IV)
(B) calcium tetraoxosulphate(VI)
(C) calcium hydroxide
(D) calcium hydrogentrioxocarbonate(IV)
11. Tetraoxosulphate(VI) acid burns the skin by
- (A) heating (B) hydration
(C) dehydration (D) hydrolysis
12. When a salt loses its water of crystallization to the atmosphere on exposure, the process is said to be
- (A) deliquescence (B) effervescence
(C) efflorescence (D) fluorescence
13. Three drops of a 1.0 mol dm^{-3} solution of NaOH are added to 20 cm^3 of a solution of pH 8.4. The pH of the resulting solution will be
- (A) greater than 8.4
(B) unaltered
(C) close to that of pure water
(D) less than 8.4
14. The solubility of a salt of molar mass 101g of 20°C is 0.34 mol dm^{-3} . If 3.40g of the salt is dissolved completely in 250 cm^3 of water in a beaker, the resulting solution is
- (A) unsaturated (B) a suspension
(C) saturated (D) supersaturated
15. 25 cm^3 of a 0.2 mol dm^{-3} solution of Na_2CO_3 requires 20 cm^3 of a solution of HCl for neutralization. The concentration of the HCl solution is
- (A) 0.6 mol dm^{-3} (B) 0.5 mol dm^{-3}
(C) 0.4 mol dm^{-3} (D) 0.2 mol dm^{-3}
16. Which of the following chlorides would exhibit the least ionic character?
- (A) AlCl_3 (B) CaCl_2 (C) MgCl_2 (D) LiCl
17. If 0.75 mole of cyclopropane and 0.66 mole of oxygen are mixed in a vessel with a total pressure of 0.7 atmosphere, what is the partial pressure of oxygen in the mixture?
- (A) 0.55 atmosphere
(B) 0.44 atmosphere
(C) 0.33 atmosphere
(D) 0.22 atmosphere
18. The processes which return carbon(IV) oxide to the atmosphere include
- (A) photosynthesis, decay and respiration
(B) photosynthesis, respiration and transpiration
(C) respiration, decay and combustion
(D) ozone depletion, combustion and decay
19. Which of the following statements is true of a proton?

- (A) The total mass of the protons in a particular nucleus is always half the nuclear mass
- (B) The mass of a proton is 1840 times the mass of an electron
- (C) The mass of a proton is 1.0008g
- (D) The mass of a proton is one-twelfth the molar mass of carbon
20. A gas X diffuses twice as fast as gas Y under the same conditions. If the relative molecular mass of X is 28, calculate the relative molecular mass of Y.
(A) 120 (B) 14 (C) 56 (D) 112
21. ${}^{14}_6\text{C} \rightarrow \text{X} + \beta$
x in the equation above represents
(A) ${}^{13}_6\text{C}$ (B) ${}^{14}_7\text{N}$ (C) ${}^{12}_5\text{B}$ (D) ${}^{12}_6\text{C}$
22. A fixed mass of gas has a volume of 92cm^3 at 3°C . What will be its volume at 18°C if the pressure remains constant?
(A) 15.3cm^3 (B) 87.3cm^3
(C) 97.0cm^3 (D) 552.0cm^3
23. The postulate of Dalton's atomic theory which still holds is that
(A) particles of different elements combine in a simple whole number ratio
(B) atoms can neither be created nor destroyed
(C) the particles of the same element are exactly alike
(D) all elements are made of small indivisible particles
24. Ordinary glass is manufactured from silica, CaCO_3 and
(A) K_2CO_3 (B) NaHCO_3
(C) Na_2CO_3 (D) K_2SO_4
25. A rock sample was added to cold dilute HNO_3 . The gas evolved was passed into a solution acidified $\text{K}_2\text{Cr}_2\text{O}_7$ and the solution turned green. The rock sample contains
(A) NO_3^- (B) Cl^- (C) SO_4^{2-} (D) SO_3^{2-}
26. Hydrogen is readily released when dilute hydrochloric acid reacts with
(A) Au (B) Cu (C) Na (D) Ag
27. The most important use of hydrogen is in the
(A) hydrogenation of oils
(B) manufacture of methyl alcohol
(C) manufacture of ammonia
(D) manufacture of ethyl alcohol
28. A red precipitate of copper(I) carbide is formed when ammonium solution of copper (I) chloride is introduced into
(A) $\text{CH}_2 = \text{CH} - \text{CH}_2\text{CH}_3$
(B) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$
(C) $\text{CH}_3 - \text{C} \equiv \text{C} - \text{CH}_3$
(D) $\text{CH}_3\text{CH}_2 - \text{C} \equiv \text{CH}$
29. Which of the following gives a precipitate when treated with NaOH solution?
(A) Na_2CO_3 (B) CH_3COONa
(C) NH_4Cl (D) AlCl_3
30. The intermediate product formed when ethanol is progressively oxidized to ethanoic acid with potassium heptaoxidochromate(VI) is
(A) ethanal (B) methanal
(C) butanal (D) propanal
31. The gas that gives brown colouration in brown ring test is
(A) CO_2 (B) NO_2 (C) NO (D) CO
32. The boiling of fat and aqueous caustic soda is referred to as
(A) saponification (B) esterification
(C) acidification (D) hydrolysis

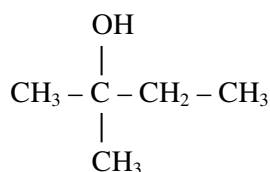
33.



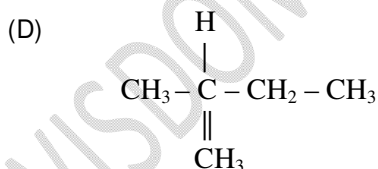
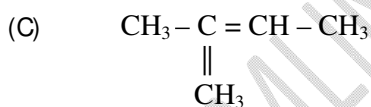
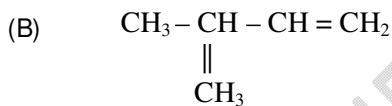
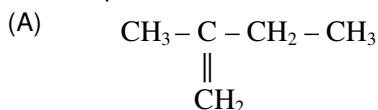
The compound above is a

- (A) tertiary alkanol (B) primary alkanol
(C) glycol
(D) secondary alkanol.

34.



The major product of the dehydration of the compound above is



35. Which of these are synthetic and natural macromolecules respectively?

- (A) Nylon and creatine, polyethylene and haemoglobin
(B) Polyethylene and creatine, nylon and haemoglobin

(C) Haemoglobin and nylon, creatine and polyethylene

(D) Nylon and polyethylene, creatine and haemoglobin

36. The number of isomers formed by C_6H_{14} is

- (A) 5 (B) 4 (C) 3 (D) 2

37. The reaction of an alkene with hydrogen in the presence of a catalyst is

- (A) an oxidative reaction
(B) a nucleophilic reaction
(C) an addition reaction
(D) a substitution reaction

38. Ethanol can easily be produced by

- (A) catalytic oxidation of methane
(B) destructive distillation of wood
(C) fermentation of starch
(D) distillation of starch solution

39. An example of an element that can catenate is

- (A) carbon (B) nitrogen
(C) bromine (D) chlorine

40. Which of the following polymers is suitable for packaging and electrical insulation?

- (A) polystyrene (B) polycarbonate
(C) polyethene (D) polyamide

41. The Arrhenius equation expresses the relationship between the speed of a reaction and its

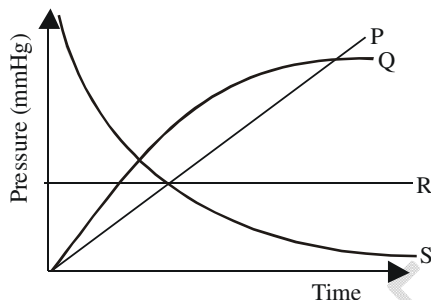
- (A) activation energy
(B) molecular collisions
(C) heat of reaction
(D) catalyst

42. The products of the electrolysis of dilute sodium hydroxide using platinum electrodes are

- (A) water and hydrogen gas

- (B) sodium metal and oxygen gas
 (C) water and sodium metal
 (D) hydrogen and oxygen gases
43. $\text{PCl}_{5(g)} \rightleftharpoons \text{PCl}_{3(g)} + \text{Cl}_{2(g)}$
 In the reaction above, a decrease in pressure will
 (A) increase the yield of PCl_5
 (B) decelerate the reaction
 (C) increase the yield of $\text{PCl}_3 \uparrow$
 (D) accelerate the reaction
44. Which of the following equations shows that a reaction is in equilibrium?
 (A) $\Delta G = 0$ (B) $\Delta G > 0$
 (C) $\Delta G < 0$ (D) $\Delta G = \Delta H - T\Delta S$

45.



In the diagram above, the curve that represents the production of oxygen gas from the decomposition of KClO_3 in the presence of MnO_2 catalyst is

- (A) S (B) R (C) Q (D) P
46. $\text{Cu}_2\text{S}_{(g)} + \text{O}_{2(g)} \rightarrow 2\text{Cu}_{(s)} + \text{SO}_{2(g)}$
 What is the change in the oxidation number of copper in the reaction above?
 (A) 0 to +1 (B) 0 to +2
 (C) +2 to +1 (D) +1 to 0
47. In the reaction $\text{E} + \text{F} \rightleftharpoons \text{G} + \text{H}$, the backward reaction is favoured if the concentration of
 (A) F is increased (B) E is increased
 (C) G is reduced (D) E is reduced

48. What amount of mercury would be liberated if the same quantity of electricity that liberates 0.65g of zinc is applied?
 (A) 1.00g (B) 2.01g (C) 4.02g (D) 8.04g
 [Zn = 665, Hg = 201]
49. When dissolved in water, NaOH flakes show
 (A) an exothermic change
 (B) an endothermic change
 (C) a rapid reaction
 (D) a slow reaction
50. When H_2S is passed into a solution of Iron (III) chloride, the solution turns
 (A) pale red (B) brown
 (C) pale green (D) colourless

UTME 2002 Answers

1. Option C.
2. Option A.
3. Option D.
4. Option B.
5. Option D.
6. Option D.
7. Option D.
8. Option A.
9. Option A.
10. Option D.
11. Option C.
12. Option C.
13. Option A.
14. Option A.
15. Option D.
16. Option A.
17. Option C.
18. Option C.
19. Option B.
20. Option D.
21. Option B.
22. Option C.

23. Option A.
24. Option C.
25. Option D.
26. Option C.
27. Option C.
28. Option D.
29. Option D.
30. Option A.
31. Option C.
32. Option A.
33. Option D.
34. Option C.
35. Option D.
36. Option A.
37. Option C.
38. Option C.
39. Option A.
40. Option A.
41. Option A.
42. Option D.
43. Option C.
44. Option A.
45. Option C.
46. Option D.
47. Option D.
48. Option B.
49. Option A.
50. Option C.

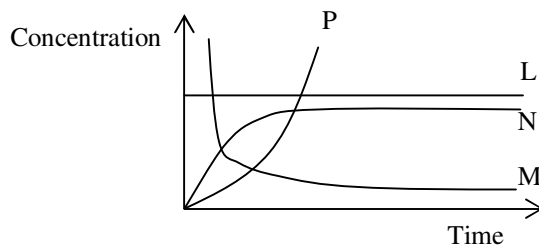
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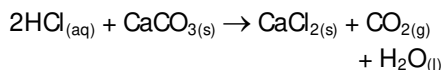
Questions

Type 6

1. What volume of oxygen is produced from the decomposition of 2 moles of KClO_3 at s.t.p?
(A) 22.4dm^3 (B) 33.6dm^3
(C) 44.8dm^3 (D) 67.2dm^3
[Molar volume of a gas at s.t.p = 22.4dm^3]
2. Which of the following is a physical change?
(A) Burning kerosene
(B) Freezing ice-cream
(C) Exposing white phosphorus to air
(D) Dissolving calcium in water
3. What is the percentage by mass of oxygen in $\text{Al}_2(\text{SO}_4)_3 \cdot 2\text{H}_2\text{O}$?
(A) 14.29% (B) 25.39%
(C) 50.79% (D) 59.25%
[Al = 27, S = 32, H = 1, O = 16]
4. The filter in a cigarette reduces the nicotine content by
(A) burning (B) adsorption
(C) evaporation (D) absorption
5. $3\text{Cu} + \text{pHNO}_3 \rightarrow 3\text{Cu}(\text{NO}_3)_2 + 4\text{H}_2\text{O} + \text{xNO}$
In the equation above, the values of p and x respectively are
(A) 1 and 3 (B) 2 and 3
(C) 6 and 2 (D) 8 and 2
6. Neutral atoms of neon with atomic number 10 have the same number of electrons as
(A) O^{2+} (B) Ca^{2+} (C) K^+ (D) Mg^{2+}
7. The noble gases owe their inactivity to
(A) octet configuration
(B) cyclic shape
(C) hexagon shape
(D) obtuse configuration
8. According to the Kinetic Theory, an increase in temperature causes the kinetic energy of particles to
(A) decrease (B) increase
(C) remain constant (D) be zero
9. I. $\text{H} = 1s^1$
II. $\text{N} = 1s^2 2s^2 2p^3$
III. $\text{O} = 1s^2 2s^2 2p^4$
IV. $\text{Zn} = 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10}$
From the above, which of the following pairs is likely to be paramagnetic?
(A) I and II (B) I and III
(C) I and IV (D) III and IV.

10. A gas exerts pressure on its container because
 (A) some of its molecules are moving faster than others
 (B) of the collision of the molecules with each other
 (C) of the mass of the molecules of gas
 (D) the molecules of a gas collide with the walls of the container.
11. When cathode rays are deflected onto the electrode of an electrometer, the instrument becomes
 (A) negatively charged
 (B) positively charged
 (C) neutral
 (D) bipolar
12. The weakest attractive force that can be observed between two molecules is
 (A) ionic
 (B) covalent
 (C) coordinate covalent
 (D) Van der Waals
13. A consequence of global warming is
 (A) air pollution
 (B) water pollution
 (C) increased humidity (D) flooding
14. Which of the following ions is acidic?
 (A) K^+ (B) NO_3^- (C) S^{2-} (D) H_3O^+
15. The structural component that makes detergent dissolve more quickly in water than soap is
 (A) $-SO_3^-Na^+$ (B) $-COO^-Na^+$
 (C) $-SO_4^-Na^+$ (D) $-COO^-K^+$
16. A liquid that will dissolve fat is
 (A) hydrochloric acid
 (B) calcium hydroxide
 (C) kerosene
 (D) water
17. What mass of K_2CrO_4 is required to prepare 250cm^3 of 0.020mol dm^{-3} solution?
 (A) 0.97g (B) 9.70g
 (C) 19.42g (D) 97.10g
 $[K_2CrO_4 = 194.2\text{g mol}^{-1}]$
18. Farmlands affected by crude-oil spillage can be decontaminated by
 (A) adding acidic solutions
 (B) using aerobic bacteria
 (C) pouring water on the affected area
 (D) burning off the oil from the area
19. When 10g of sodium hydroxide is dissolved in 100cm^3 of water, the solution formed is approximately
 (A) 0.01mol dm^{-3} (B) 0.10mol dm^{-3}
 (C) 0.25mol dm^{-3} (D) 0.50mol dm^{-3}
 $[Na = 23, H = 1, O = 16]$
20. A change in the temperature of a saturated solution disturbs the equilibrium between the
 (A) dissolved solute and the solvent
 (B) solvent and the undissolved solute
 (C) dissolved solute and the undissolved solute
 (D) dissolved solute and the solution.
21. If an equilibrium reaction has $\Delta H > 0$, the reaction will proceed favourably in the forward direction at
 (A) high temperature
 (B) any temperature
 (C) low temperature
 (D) minimum temperature
- 22.





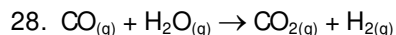
From the reaction above, which of the curves in the diagram represents the production of carbon(IV) oxide as dilute HCl is added?

- (A) L (B) M (C) N (D) P

23. The commonest feature of reactions at the anode is that
 (A) electrons are consumed
 (B) oxidation is involved
 (C) ions are reduced
 (D) electrode dissolves.
24. Which of the following will change when a catalyst is added to a chemical reaction?
 (A) The activation energy
 (B) The potential energy of the reactants
 (C) The heat of reaction
 (D) The potential energy of the products.
25. If Y is an oxidizing agent that reacts with a reducing agent, Z, which of the following is correct?
 (A) Y increases in oxidation number
 (B) Y becomes reduced
 (C) Z loses protons
 (D) Z gains protons.
26. When at equilibrium, which of the reactions below will shift to the right if the pressure is increased and the temperature is kept constant?
 (A) $2\text{SO}_{3(\text{g})} \rightleftharpoons 2\text{SO}_{2(\text{g})} + \text{O}_{2(\text{g})}$
 (B) $2\text{CO}_{2(\text{g})} \rightleftharpoons 2\text{CO}_{(\text{g})} + \text{O}_{2(\text{g})}$
 (C) $2\text{H}_{2(\text{g})} + \text{O}_{2(\text{g})} \rightleftharpoons 2\text{H}_2\text{O}_{(\text{g})}$
 (D) $2\text{NO}_{(\text{g})} \rightleftharpoons \text{N}_{2(\text{g})} + \text{O}_{2(\text{g})}$
27. In the electrolysis of a concentrated solution of sodium chloride using inert electrodes, which of the following ions

are discharged at the cathode and anode respectively?

- (A) Na^+ and Cl^- (B) Na^+ and OH^-
 (C) H^+ and OH^- (D) H^+ and Cl^-



From the reaction above, calculate the standard heat change if the standard enthalpies of formation of $\text{CO}_{2(\text{g})}$, $\text{H}_2\text{O}_{(\text{g})}$ and $\text{CO}_{(\text{g})}$ in kJmol^{-1} are -394 , -242 and -110 respectively.

- (A) -262kJmol^{-1} (B) -42kJmol^{-1}
 (C) $+42\text{kJmol}^{-1}$ (D) $+262\text{kJmol}^{-1}$

29. When a sugar is dissolved in tea, the reaction is always accompanied by

- (A) positive entropy change
 (B) negative entropy change
 (C) no entropy change
 (D) a minimum entropy change

30. Which of the following is an electrolyte?

- (A) Alcohol
 (B) Sodium acetate solution
 (C) Solid potassium hydroxide
 (D) mercury

31. Chlorine gas is prepared in the laboratory by

- (A) adding concentrated hydrochloric acid to solid manganese(IV) oxide
 (B) adding concentrated tetraoxosulphate(VI) acid to solid sodium chloride
 (C) dropping concentrated hydrochloric acid onto potassium tetraoxomanganate(VII) crystals
 (D) oxidizing concentrated hydrochloric acid using potassium heptaoxodichromate(VI) crystals.

32. Metals of the first transition series have special properties which are different from those of groups I and II elements because they have partially filled

- (A) s orbitals (B) p orbitals
(C) d orbitals (D) f orbitals
33. Hydrogen can be displaced from a hot alkaline solution by
(A) Fe (B) Cu (C) Ca (D) Sn
34. Which of the following statements is true of sulphur(IV)oxide?
(A) It forms tetraoxosulphate(VI) acid with water.
(B) It is an odourless gas
(C) It is an acid anhydride
(D) It forms white precipitate with acidified barium chloride.
35. The salt that will form a precipitate soluble in excess ammonia solution is
(A) $\text{Ca}(\text{NO}_3)_2$ (B) $\text{Cu}(\text{NO}_3)_2$
(C) $\text{Mg}(\text{NO}_3)_2$ (D) $\text{Al}(\text{NO}_3)_3$
36. The metal that liberates hydrogen from cold water in bubbles only is
(A) Na (B) K (C) Ca (D) Al
37. Chlorine gas turns a damp starch-iodide paper
(A) pink (B) colourless
(C) red (D) dark blue
38. The modern process of manufacturing steel from iron is by
(A) treatment with acids
(B) oxidation
(C) blast reduction
(D) treatment with alkalis
- 39.
- The diagram shows a test tube containing $\text{Pb}(\text{NO}_3)_2$ crystals being heated. The gas evolved is collected in a gas jar labeled 'Y' which is inverted in a trough of water. The gas jar is submerged in a 'Freezing mixture'. The gas is identified as CO_2 .
- In the diagram above, Y is
- (A) NO (B) NO_2 (C) N_2O_5 (D) N_2O_3
40. Ethene reacts with hydrogen bromide to give
(A) CH_2Br_2 (B) $\text{CH}_3\text{CH}_2\text{Br}$
(C) $\text{C}_2\text{H}_2\text{Br}_2$ (D) CHBr_3
41. Carbohydrates are compounds containing carbon, hydrogen and oxygen in the ratio
(A) 3 : 1 : 1 (B) 2 : 1 : 1
(C) 1 : 2 : 1 (D) 1 : 1 : 1
42. How many isomers does pentane have?
(A) 6 (B) 5 (C) 4 (D) 3
43. The leachate of a certain plant ash is used in local soap-making because it contains
(A) sodium chloride and potassium hydroxide
(B) sodium hydroxide
(C) potassium hydroxide
(D) soluble carbonates and hydrogen carbonates.
44. The formula of ethyl butanoate is
(A) $\text{C}_3\text{H}_7\text{COOC}_2\text{H}_5$ (B) $\text{C}_2\text{H}_5\text{COOC}_3\text{H}_7$
(C) $\text{C}_4\text{H}_9\text{COOC}_2\text{H}_5$ (D) $\text{C}_2\text{H}_5\text{COOC}_4\text{H}_9$
45. The type of reaction that is peculiar to benzene is
(A) addition (B) hydrolysis
(C) polymerization (D) substitution
46. Ethanol reacts with excess acidified $\text{K}_2\text{Cr}_2\text{O}_7$ to produce
(A) ethanedioic acid (B) ethanal
(C) ethyl ethanoate (D) ethanoic acid
47. A compound contains 40.0% carbon, 6.7% hydrogen and 53.3% oxygen. If the molar mass of the compound is 180, find the molecular formula
(A) CH_2O (B) $\text{C}_3\text{H}_6\text{O}_3$
(C) $\text{C}_6\text{H}_{12}\text{O}_6$ (D) $\text{C}_6\text{H}_6\text{O}_3$

[H = 1, C = 12, O = 16]

48. The process by which atoms are rearranged into different molecular structures in the petroleum refining process is referred to as
(A) catalytic cracking (B) hydrocracking
(C) polymerization (D) reforming
49. Which of the following is found in cotton?
(A) Starch (B) Cellulose (C) Fat (D) Oil
50. The principal constituent of natural gas is
(A) methane (B) ethane
(C) propane (D) butane

UTME 2003 Answers

- Option D.
- Option B.
- Option D.
- Option B.
- Option D.
- Option D.
- Option A.
- Option B.
- Option A.
- Option D.
- Option A.
- Option D.
- Option D.
- Option D.
- Option A.
- Option C.
- Option A.
- Option B.
- Option C.
- Option C.
- Option C.
- Option A.
- Option B.

- Option A.
- Option B.
- Option C.
- Option D.
- Option B.
- Option A.
- Option B.
- Option A.
- Option C.
- Option D.
- Option C.
- Option C.
- Option B.
- Option C.
- Option D.
- Option C.
- Option D.
- Option C.
- Option B.
- Option B.
- Option C.
- Option D.
- Option C.
- Option C.
- Option B.
- Option C.
- Option D.
- Option C.
- Option D.
- Option B.
- Option A.

UTME 2004

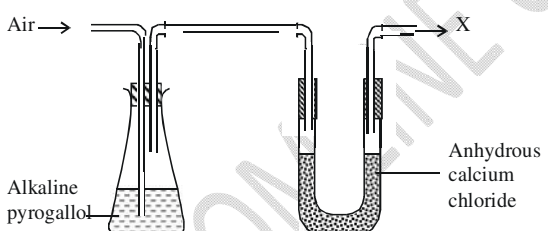
Questions

Type R

- In the electrolysis of brine, the anode is
(A) zinc (B) platinum
(C) carbon (D) copper
- $\text{N}_2\text{O}_{4(g)} \rightleftharpoons 2\text{NO}_{2(g)}$
In the endothermic reaction above, more product formation will be favoured by
(A) a decrease in pressure
(A) a decrease in volume
(B) an increase in pressure

- (C) a constant volume
- The oxidation state of chlorine in HClO is
(A) -1 (B) -5 (C) +7 (D) +1
 - Which of the following hydrogen halides has the highest entropy value?
(A) HBr (B) HF (C) HI (D) HCl
 - The mass of silver deposited when a current of 10A is passed through a solution of silver salt for 4830s is
(A) 54.0g (B) 27.0g (C) 13.5g (D) 108.0g
 - Which of the following acts as both a reducing and an oxidizing agent?
(A) H₂S (B) CO₂ (C) H₂ (D) SO₂
 - Which of the following shows little or no net reaction when the volume of the system is decreased?
(A) $2\text{O}_{3(g)} \rightleftharpoons 3\text{O}_{2(g)}$
(B) $\text{H}_{2(g)} + \text{I}_{2(g)} \rightleftharpoons 2\text{HI}_{(g)}$
(C) $2\text{NO}_{2(g)} \rightleftharpoons \text{N}_2\text{O}_{4(g)}$
(D) $\text{PCl}_{5(g)} \rightleftharpoons \text{PCl}_{3(g)} + \text{Cl}_{2(g)}$
 - $2\text{CO}_{(g)} + \text{O}_{2(g)} \rightarrow 2\text{CO}_{2(g)}$
Given that $\Delta H [\text{CO}]$ is -110.4kJmol^{-1} and $\Delta H [\text{CO}_2]$ is -393.0kJmol^{-1} , the energy change for the reaction above is
(A) -282.6kJ (B) $+503.7\text{kJ}$
(C) -503.7kJ (D) $+282.6\text{kJ}$
 - $\text{ZnO}_{(s)} + \text{CO}_{(g)} \xrightarrow{\text{heat}} \text{Zn}_{(s)} + \text{CO}_{2(g)}$
In the reaction above, zinc has been
(A) displaced (B) oxidized
(B) reduced (D) decomposed
 - What volume of gas is evolved at s.t.p. if 2g of calcium trioxocarbonate(IV) is added to a solution of hydrochloric acid?
(A) 224cm^3 (B) 112cm^3
(C) 2240cm^3 (D) 448cm^3
[Ca = 40, C = 12, O = 16, Cl = 35.5, H = 1, Molar volume of a gas at s.t.p = 22.4dm^3]
 - A chemical reaction is always associated with
(A) a change in the nature of the reactants
(B) the formation of new substances
(C) a change in the volume of the reactants
(D) an increase in the composition of one of the substances.
 - When a solid substance disappears completely as a gas on heating, the substance is said to have undergone
(A) sublimation (B) crystallization
(C) distillation (D) evaporation
 - If a solution contains 4.9g of tetraoxosulphate(VI) acid, calculate the amount of copper(II) oxide that will react with it
(A) 40.0g (B) 80.0g (C) 0.8g (D) 4.0g
[Cu = 64, O = 16, S = 32, H = 1]
 - Vulcanization involves the removal of
(A) the single bond (B) the double bond
(C) a polymer (D) a monomer
 - The alkyl group can be represented by the general formula
(A) C_nH_{2n} (B) C_nH_{2n-2}
(C) C_nH_{2n+1} (D) C_nH_{2n+2}
 - $\text{C}_2\text{H}_5\text{OH}_{(aq)} \xrightarrow[\text{180}^\circ\text{C}]{\text{Conc. H}_2\text{SO}_4} \text{Y}$
In the reaction above, Y represents
(A) C₂H₅COOH (B) CH₄
(C) CH₃OCH₃ (D) C₂H₄
 - In the production of soap, concentrated sodium chloride solution is added to
(A) saponify the soap
(B) emulsify the soap
(C) decrease the solubility of the soap
(D) increase the solubility of the soap
 - Oxyacetylene flame is used for iron-welding because it

- (A) evolves a lot of heat when burnt
 (B) dissociates to produce carbon(IV) oxide and oxygen
 (C) makes the iron metal solidify very quickly
 (D) combines with oxygen to give a pop sound.
19. Which of these reagents can confirm the presence of a triple bond?
 (A) Bromine gas
 (B) Bromine water
 (C) Acidified KMnO_4
 (D) Copper(I) Chloride
- 20.
- $$\begin{array}{ccccccc} & & \text{H} & \text{CH}_3 & & & \\ & & | & | & & & \\ \text{H}_3\text{C} & - & \text{C} & - & \text{C} & - & \text{CH}_2 - \text{CH}_2 - \text{CH}_3 \\ & & | & | & & & \\ & & \text{CH}_3 & \text{H} & & & \end{array}$$
- The IUPAC nomenclature of the compound above is
 (A) 3,4-dimethylhexane
 (B) 2,3-dimethylhexane
 (C) 2-ethylhexane
 (D) 2-ethylpentane
21. An isomer of C_5H_{12} is
 (A) 2-ethylbutane (B) butane
 (C) 2-methylbutane (D) 2-methylpropane
22. Alkanol + Alkanoic acid \rightleftharpoons Ester + Water
 The reverse reaction of the equation above is known as
 (A) saponification (B) hydrolysis
 (C) fermentation (D) hydration
23. $\text{CH}_3\text{COOH}_{(\text{aq})} \rightarrow \text{CH}_4_{(\text{g})} + \text{CO}_2_{(\text{g})}$
 The reaction above is
 (A) acidification (B) esterification
 (C) decarboxylation (D) carboxylation
24. A characteristic of the alkane family is
 (A) substitution reaction
 (B) neutralization reaction
 (C) addition reaction
 (D) elimination reaction
25. Pollution of underground water by metal ions is very likely in a soil that has high
 (A) alkalinity (B) nitrate content
 (C) acidity (D) chloride content
26. The solubility in mol dm^{-3} of 20g of CuSO_4 dissolved in 100g of water at 180°C is
 (A) 0.25 (B) 0.13 (C) 2.00 (D) 1.25
27. Which of these compounds is a normal salt?
 (A) Na_2CO_3 (B) NaHCO_3
 (C) NaHSO_4 (D) NaHS
28. A carcinogenic substance is
 (A) nitrogen(II) oxide (B) carbon(II) oxide
 (C) asbestos dust (D) sawdust
29. What volume of $0.5 \text{ mol dm}^{-3} \text{ H}_2\text{SO}_4$ will exactly neutralize 20 cm^3 of $0.1 \text{ mol dm}^{-3} \text{ NaOH}$ solution?
 (A) 5.0 cm^3 (B) 6.8 cm^3
 (C) 8.3 cm^3 (D) 2.0 cm^3
30. Calcium tetraoxosulphate(VI) dissolves in water only sparingly to form a
 (A) colloid (B) solution
 (C) suspension (D) precipitate
31. Hardness of water is caused by the presence of the ions of
 (A) calcium and magnesium
 (B) calcium and sodium
 (C) magnesium and silver
 (D) sodium and potassium
32. It is difficult to achieve an orderly arrangement of the molecules of a gas because they

- (A) can collide with one another in the container
 (B) are too small in size
 (C) have little force of attraction between them
 (D) have no definite shape
33. The shape of the s-orbital is
 (A) elliptical (B) spiral
 (C) circular (D) spherical
34. Which of the following mixtures of gases is likely to burn in flame?
 (A) Helium and neon
 (B) Neon and nitrogen
 (C) Neon and hydrogen
 (D) Nitrogen and helium
35. The property of chlorine which causes hydrogen chloride to be more ionic than the chlorine molecule is its.
 (A) electronegativity
 (B) electropositivity
 (C) electron affinity
 (D) electrovalency
- 36.
- 
- In the experiment above, X is a mixture of nitrogen, carbon(IV) oxide and
 (A) oxygen (B) inert gas
 (C) water (D) impurities
37. A given volume of methane diffuses in 20s. How long will it take the same volume of sulphur(IV)oxide to diffuse under the same conditions?
 (A) 40s (B) 60s (C) 20s (D) 5s
 [C = 12, H = 1, S = 32, O = 16]
38. Chlorine consisting of two isotopes of mass numbers 35 and 37 in the ratio 3 : 1 has an atomic mass of 35.5. Calculate the relative abundance of the isotope of mass number 37.
 (A) 60 (B) 20 (C) 75 (D) 25
39. An electron can be added to a halogen atom to form a halide ion with
 (A) 8 valence electrons
 (B) 7 valence electrons
 (C) 2 valence electrons
 (D) 3 valence electrons.
40. ${}_{88}^{226}\text{Ra} \rightarrow {}_{86}^x\text{Rn} + \alpha$ - particle
 What is the value of x in the nuclear reaction above?
 (A) 226 (B) 220 (C) 227 (D) 222
41. According to Charles' law, the volume of a gas becomes zero at
 (A) -100°C (B) -273°C
 (C) -373°C (D) 0°C
42. When steam is passed over red-hot carbon, the substances produced are
 (A) hydrogen and carbon(II) oxide
 (B) hydrogen and carbon(IV) oxide
 (C) hydrogen and trioxocarbonate(IV) acid
 (D) hydrogen, oxygen and carbon(IV) oxide.
43. Aluminium hydroxide is used in the dyeing industry as a
 (A) dye (B) dispersant
 (C) salt (D) mordant
44. Transition metals possess variable oxidation states because they have
 (A) electrons in the s orbitals
 (B) electrons in the d orbitals
 (C) partially filled p orbitals
 (D) a variable number of electrons in the p orbitals.

-
45. The allotrope of carbon used in the decolourization of sugar is
(A) soot (B) lampblack
(C) graphite (D) charcoal
46. Carbon is tetravalent because
(A) the 2s and 2p atomic orbitals hybridize
(B) all the atomic orbitals of carbon hybridize
(C) the electrons in all the orbitals of carbon are equivalent
(D) the electrons in both the 2s and 2p orbitals are equivalent.
47. Sodium metal is always kept under oil because it
(A) is reduced by atmospheric nitrogen
(B) readily reacts with water
(C) reacts with oxygen and carbon(IV) oxide
(D) reacts vigorously on exposure to air
48. Alloys are best prepared by
(A) cooling a molten mixture of the metals
(B) reducing a mixture of their metallic oxides
(C) arc-welding
(D) electroplating.
49. Sulphur (IV) oxide bleaches by
(A) hydration (B) reduction
(C) absorption (D) oxidation
50. Which of the following gases can be collected by the method of downward delivery?
(A) Oxygen (B) Hydrogen
(C) Chlorine (D) Ammonia.

UTME 2004 Answers

1. Option C.
2. Option A.
3. Option C.
4. Option B.
5. Option A.
6. Option D.
7. Option B.
8. Option A.
9. Option C.
10. Option D.
11. Option B.
12. Option A.
13. Option D.
14. Option B.
15. Option C.
16. Option D.
17. Option C.
18. Option A.
19. Option D.
20. Option B.
21. Option C.
22. Option B.
23. Option C.
24. Option A.
25. Option C.
26. Option D.
27. Option A.
28. Option C.
29. Option D.
30. Option C.
31. Option A.
32. Option C.
33. Option D.
34. Option C.
35. Option A.
36. Option B.
37. Option A.
38. Option D.
39. Option A.

40. Option D.
41. Option B.
42. Option A.
43. Option D.
44. Option B.
45. Option D.
46. Option A.
47. Option D.
48. Option A.
49. Option B.
50. Option C.

UTME 2005

Questions

Type 4

1. Which of the following equimolar solutions will have the highest pH?
 - A. CH_3COONa
 - B. NaOH
 - C. HCl
 - D. NH_4OH
2. Which of the following ions requires the highest quantity of electricity for discharge at an electrode?
 - A. 4.0 moles of Cl^-
 - B. 3.0 moles of Na^+
 - C. 2.5 moles of Cu^{2+}
 - D. 2.0 moles of Al^{3+}
3. Phenolphthalein in acidic solution is
 - A. red
 - B. orange
 - C. colourless
 - D. yellow
4. When iron is exposed to moisture and it rusts, the value of ΔG for the reaction is
 - A. neutral
 - B. zero
 - C. positive
 - D. negative
5. In which of the following reactions can the oxidation number of nitrogen be said to have increased?
 - A. $2\text{NO}_{(g)} + \text{O}_{2(g)} \rightarrow 2\text{NO}_{2(g)}$
 - B. $\text{NO}_{(g)} + \text{Cl}_{2(g)} \rightarrow \text{NOCl}_{2(l)}$
 - C. $\text{FeSO}_{4(aq)} + \text{NO}_{(g)} \rightarrow \text{Fe}(\text{NO})\text{SO}_{4(s)}$
 - D. $\text{NO}_{(g)} + \text{Br}_{2(l)} \rightarrow \text{NOBr}_{2(l)}$
6. $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}; \quad \Delta H = -571\text{kJ}$

In the equation above, how much heat will be liberated if 12.0g of hydrogen is burnt in excess oxygen?

 - A. -1142kJ
 - B. -571kJ
 - C. $+1142\text{kJ}$
 - D. -1713kJ
7. A concentrated solution containing H^+ , Cu^{2+} , OH^- and Cl^- was electrolyzed using platinum electrodes. The ion that will be discharged at the cathode is
 - A. Cu^{2+}
 - B. Cl^-
 - C. H^+
 - D. OH^-
8. When sulphur (IV) oxide is passed into a solution of sodium hydroxide for a long time, it eventually produces a solution of
 - A. NaHSO_4
 - B. Na_2SO_3
 - C. NaHSO_3
 - D. Na_2SO_4
9. What is the correct IUPAC name for NO_2^- ?
 - A. Dioxonitrate(IV) ion
 - B. Trioxonitrate(III) ion
 - C. Trioxonitrate(IV) ion
 - D. Dioxonitrate(III) ion
10. What will happen if an aluminium spoon is used to stir a solution of iron(II) trioxonitrate(V)?
 - A. The spoon will be oxidized while the iron (II) ions will be reduced to the metal.
 - B. The spoon will increase in size
 - C. The spoon will be reduced while the iron (II) ions will be oxidized.
 - D. The spoon will be reduced.
11. $\text{CH}_3 - \text{CH} - \text{CH} = \text{CH}_2$

$$\begin{array}{c} | \\ \text{CH}_3 \end{array}$$

The IUPAC nomenclature for the hydrocarbon above is

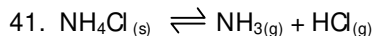
 - A. 1,2-dimethylprop-2-ene
 - B. 1,1-dimethylprop-2-ene
 - C. 2-methylbut-3-ene

- D. 3-methylbut-1-ene.
- The enzyme responsible for converting sucrose into two simple isomeric sugars is
 - maltase
 - amylase
 - invertase
 - lactase
 - The decolourization of the purple colour of tetraoxomanganate (VII) ion is a test for
 - alkenes
 - alkanols
 - alkanals
 - alkanes
 - Which of the following are structural isomers?
 - Propanoic acid and propan-1,2-diol
 - Propanal and propanone
 - Ethanoic acid and propanoic acid
 - Ethan-1,2-diol and ethanoic acid
 - In the purification of impure samples of ethyl ethanoate synthesized by esterification, concentrated sodium trioxocarbonate(IV) solution is used to remove
 - water
 - basic impurities
 - acidic impurities
 - ethoxyethane
 - How many hydrogen atoms does a single ring cycloalkane have less than the corresponding open-chain alkane?
 - Two
 - Three
 - Four
 - One
 - Equal moles of ethyne and hydrogen iodide react to give
 - $\text{CH}_2 = \text{CH}_2$
 - $\text{CH}_2 - \text{CHI}$
 - $\text{CH}_3 - \text{Cl}_3$
 - $\text{CH}_2 = \text{CHI}$
 - A substance that is used as a ripening agent for fruits is
 - ethene
 - propene
 - methane
 - butane
 - When water boilers are used for a long period of time, the solid substances left behind as scale are
 - magnesium trioxosilicate (IV) and rust
 - magnesium trioxosilicate(IV) and calcium tetraoxosulphate(VI)
 - clay and magnesium trioxosilicate(IV)
 - clay and rust
 - 25cm^3 of a mixture of noble gases was obtained from air after the removal of other constituents. What was the original volume of air?
 - 2500cm^3
 - 1500cm^3
 - 125cm^3
 - 80cm^3
 - The solubility curve shows the variation of solute concentration with
 - volume
 - temperature
 - vapour density
 - pressure
 - The air around smelting industries is likely to contain
 - H_2S , CO and N_2
 - CO_2 , SO_2 and H_2
 - H_2 , SO_2 and CO_2
 - SO_2 , N_2 and CO_2
 - Kerosine is commonly used to remove the red colour stain of palm oil from clothes because it
 - helps to spread the oil over a larger surface area
 - reacts with the oil to form an odourless compound
 - makes the oil to evaporate easily by dissolving it
 - helps to dilute the oil and reduce its colour
 - The gas that is the most dangerous pollutant to humans is
 - sulphur(IV) oxide
 - carbon(IV) oxide
 - nitrogen(II) oxide
 - hydrogen sulphide

25. Natural water collected from rivers and ponds contains oxygen, carbon(IV) oxide and
- A. nitrogen B. hydrogen
C. chlorine D. sulphur(IV) oxide
26. How many moles of limestone will be required to produce 5.6kg of CaO?
A. 0.20mol. B. 0.10mol.
C. 1.12mol. D. 0.56mol.
[Ca = 4, C = 12, O = 16]
27. The shape of the hydrocarbon compound CH₄ is
A. square planar B. planar
C. linear D. tetrahedral
28. Which of these properties gives a solid its definite shape?
A. Strong intermolecular attraction
B. High melting point
C. High boiling point
D. Weak intermolecular attraction
29. Sugar is separated from its impurities by
A. precipitation B. crystallization
C. distillation D. evaporation
30. The component of an atom that contributes least to its mass is the
A. proton B. nucleus
C. neutron D. electron
31. An element will readily form an electrovalent compound if its electron configuration is
A. 2,8,1 B. 2, 8, 4 C. 2, 8, 8 D. 2, 8, 5
32. A heterogenous mixture can be defined as any mixture
A. of a solute and a solvent
B. whose composition is uniform
C. whose composition is not uniform
D. formed by solids and liquids
33. The pressure of 100 cm³ of oxygen at 35°C is 750mmHg. What will be the volume of the gas if the pressure is reduced to 100mmHg without changing the temperature?
A. 650 cm³ B. 850 cm³
C. 580 cm³ D. 750 cm³
34. I. Treatment of cancer
II. Detection of leakages in water mains
III. Detection of the ages of ancient tools
IV. Preparation of drugs
Which combination of the above refers to the uses of radioactive isotopes?
A. II and III B. I and II
C. I, II and III D. I, II, III and IV.
35. What is the valence shell electron configuration of the element with atomic number 17?
A. 1s²2s²2p⁶3s²3p⁴ B. 1s²2s²2p⁶3s²3p⁵
C. 2s²2p⁶ D. 3s²3p⁵
36. The density of a certain gas is 1.98gdm⁻³ at s.t.p. What is the molecular mass of the gas?
A. 44.0g B. 54.0g C. 26.0g D. 31.0g
[Molar volume of gas at s.t.p = 22.4dm³]
37. When pure aluminium metal is heated to red hot in the presence of nitrogen gas, the compound formed is
A. Al₂N B. Al₂N₂ C. AlN D. Al₂N₃
38. A dense white fume is formed when ammonia gas reacts with
A. O_{2(g)} B. H_{2(g)} C. Cl_{2(g)} D. HCl_(g)
39. $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$ $\Delta H = -90kJ$
In the equation above, the yield of ammonia can be decreased by
A. increasing the pressure
B. removing ammonia as it is formed
C. increasing the temperature
D. adding a catalyst

40. The gas that can be dried using concentrated tetraoxosulphate(VI) acid is

- A. hydrogen bromide
- B. sulphur(IV) oxide
- C. hydrogen sulphide
- D. ammonia



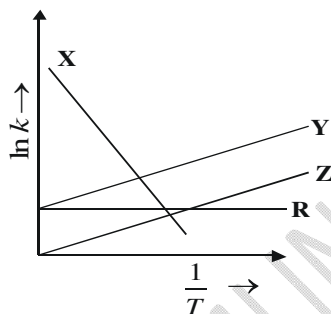
The reaction above can only attain equilibrium if

- A. a gaseous reactant is added
- B. one of the products is removed
- C. it is in a closed system
- D. it is in an open system

42. The most suitable metal that can be used as a lightning conductor is

- A. silver B. copper C. iron D. aluminium

43.



In the diagram above, which of the curves illustrates Arrhenius' law?

- A Y B. Z C. R D. X

44. The most abundant element on the earth's crust is

- A. nitrogen B. hydrogen
- C. oxygen D. fluorine

45. Metalloids are also referred to as

- A. semi-metals B. metals
- C. colloids D. non-metals

46. The ores that can be concentrated by flotation are

- A. nitride ores B. sulphide ores

- C. oxide ores D. chloride ores

47. The property used in the industrial preparation of nitrogen and oxygen from air is

- A. rate of diffusion B. density
- C. boiling point D. solubility

48. In a flame test for calcium, the flame appears

- A. green when viewed through a blue glass
- B. blue when viewed through a blue glass
- C. orange-red when viewed through a blue glass
- D. brick-red when viewed through a blue glass

49. Which of the following alloys contains iron?

- A. Duralumin and steel
- B. Brass and bronze
- C. Steel and permalloy
- D. Soft solder and duralumin

50. To obtain pure carbon(II) oxide from its mixture with carbon(IV) oxide, the mixture should be

- A. passed over heated copper(II) oxide
- B. bubbled through water
- C. bubbled through concentrated tetraoxosulphate(VI) acid
- D. bubbled through sodium hydroxide.

UTME 2005 Answers

1. Option B.
2. Option D.
3. Option C.
4. Option D.
5. Option A.
6. Option D.
7. Option A.
8. Option C.

9. Option D.
10. Option A.
11. Option D.
12. Option C.
13. Option A.
14. Option B.
15. Option C.
16. Option A.
17. Option D.
18. Option A.
19. Option B.
20. Option A.
21. Option B.
22. Option D.
23. Option C.
24. Option D.
25. Option A.
26. Option B.
27. Option D.
28. Option A.
29. Option B.
30. Option D.
31. Option A.
32. Option C.
33. Option D.
34. Option C.
35. Option D.
36. Option A.
37. Option C.
38. Option D.
39. Option C.
40. Option B.
41. Option C.
42. Option B.
43. Option D.
44. Option C.
45. Option A.
46. Option B.
47. Option C.
48. Option A.

49. Option C
50. Option D.

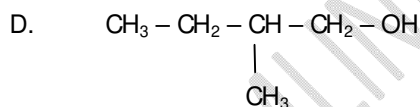
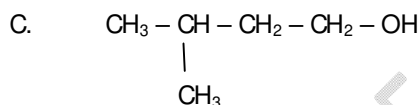
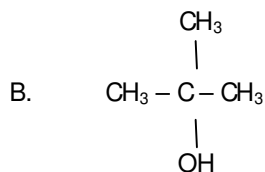
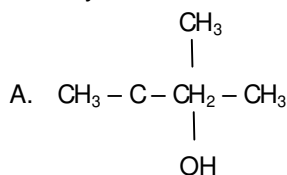
UTME 2007

Questions

TYPE L

1. How many structural isomers of chlorobutane are possible?
A. 3 B. 1 C. 4 D. 2
2. The conversion of open chain alkanes into cycloalkanes and aromatic compounds is called
A. reforming B. cracking
C. isomerization D. polymerization
3. Which of the following represents an aromatic compound?
A. C_6H_9OH B. C_6H_8
C. C_6H_{12} D. C_6H_5OH
4. Certain useful waxes are composed mainly of
A. amino acids B. alkanates
C. glycerols D. alkanols
5. Which of the following alkanes has the highest boiling point?
A. Propane B. Ethane
C. Methane D. Pentane
6. The IUPAC nomenclature of the compound $CH_3CH_2COOCH_2CH_3$ is
A. ethyl propanoate
B. propyl ethanoate
C. ethyl butanoate
D. methyl butanoate
7. Which of the following compounds is the best possible anti-knock agent for petrol?
A. $(CH_3)_3C - CH_2CH_2CH_3$
B. $(CH_3)_2CH - CH(CH_3)CH_2CH_3$
C. $CH_3CH_2(CH_3)CHCH_2CH_2CH_3$
D. $CH_3CH_2CH_2CH_2CH_2CH_2CH_3$
8. $CH_3CH_2Cl + KCN \rightarrow CH_3CH_2CN + KCl$
In the reaction above, the cyanide is

- A. electrophilic B. hydrophilic
C. hydrophobic D. nucleophilic
9. The hydrocarbon used in the production of styrene is
A. propyne B. ethane
C. ethane D. ethyne
10. Which of the following compounds is a tertiary alcohol?

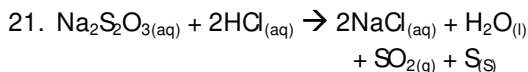


11. If the electron configuration of an element is $1s^2 2s^2 2p^5$, how many unpaired electrons are there?
A. 5 B. 4 C. 2 D. 1
12. A metal X forms two bromides with the formulae XBr and XBr_3 . What type of bonding exists between X and bromine in the bromides?
A. Dative bonding B. Metallic bonding
C. Ionic bonding D. Covalent bonding
13. $\text{MnO}_2(\text{s}) + x\text{HCl}(\text{aq}) \rightarrow \text{MnCl}_2(\text{aq}) + y\text{H}_2\text{O}(\text{l}) + z\text{Cl}_2(\text{g})$

In the equation above, what are the values of x, y and z respectively?

- A. 4, 2, 1 B. 2, 1, 2
C. 4, 1, 2 D. 1, 2, 1
14. The elements that belong to the third period of the periodic table are
A. Na, P, O and Cl B. B, C, N and O
C. Na, Mg, S and Ar D. Li, Be, Al and P
15. A mixture of petrol and water can be separated through
A. centrifugation
B. the use of filter paper
C. distillation
D. the use of separating funnel
16. Calculate the mass of chlorine gas which occupies a volume of 1.12dm^3 at s.t.p.
A. 3.55g B. 15.50g C. 1.80g D. 7.10g
[Cl = 35.5, Molar volume of a gas at s.t.p. = 22.4dm^3]
17. Which experiment led to the measurement of the charge on an electron?
A. Discharge-tube experiment
B. Scattering α - particles
C. Mass spectrometric experiment
D. Oil-drop experiment
18. What is the volume of oxygen required to burn completely 45cm^3 of methane at s.t.p.
A. 135.0cm^3 B. 180.0cm^3
C. 90.0cm^3 D. 45.0cm^3
19. How many electrons are in the L shell of ${}_{15}^{31}\text{P}$?
A. 8 B. 18 C. 2 D. 5
20. Which of the following decreases when a given mass of a gas is compressed to half its initial volume?
A. Frequency of collisions
B. Number of molecules present

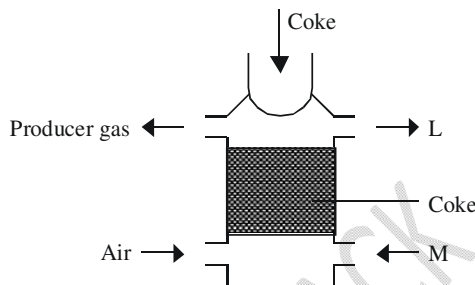
- C. Atomic radius of each particle
D. Average intermolecular distance



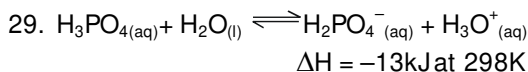
Which of the following would introduce the greatest increase in the rate of the chemical reaction above?

- A. An increase in temperature and an increase in the concentration of the reactants.
B. A decrease in volume and an increase in the pressure of the reactants.
C. An increase in temperature and a decrease in the concentration of the reactants.
D. A decrease in temperature and an increase in the concentration of the reactants.
22. An element used in the production of matches is
A. aluminium B. sulphur
C. copper D. nitrogen
23. When calcium oxide is heated with carbon, the oxide will
A. be converted to the trioxocarbonate(IV) salt
B. decompose to the metal
C. be converted to the carbide
D. melt, producing carbon (IV) oxide

Use the diagram below to answer questions 24 and 25.



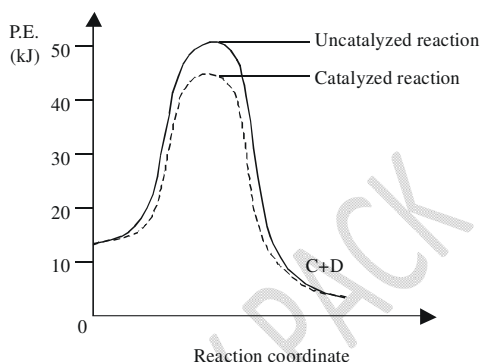
24. The alternative raw material labeled M is
A. steam B. carbon
C. natural gas D. oxygen
25. The fuel gas labeled L is
A. carbon (IV) oxide B. hydrogen
C. nitrogen D. water gas
26. The reddish-brown rust on iron roofing sheets consists of
A. $\text{Fe}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$ B. $\text{Fe}^{3+}(\text{H}_2\text{O})_6$
C. $\text{FeO} \cdot \text{H}_2\text{O}$ D. $\text{Fe}_3\text{O}_4 \cdot 2\text{H}_2\text{O}$
27. The tincture of iodine means iodine dissolved in
A. bromine chloride B. chlorine water
C. water D. ethanol
28. A solution which on treatment with hydrochloric acid produces a colourless, odourless gas which turns lime water milky is most likely to be a
A. trioxocarbonate(IV)
B. trioxonitrate(V)
C. hydroxide
D. chloride



In the reaction above, an increase in temperature would

- A. have no effect on the reaction
 - B. slow down the reverse reaction
 - C. favour the forward reaction
 - D. favour the reverse reaction
30. Which of the following sets of metals dissolves in dilute HCl?
- A. Mg, Sn and Fe
 - B. Mg, Fe and Cu
 - C. Fe, Sn and Cu
 - D. Cu, Mg and Sn
31. If chlorine is bubbled into water and the resulting yellowish-green solution is exposed to bright sunlight for a while, the solution will decompose giving out
- A. oxygen, thereby producing hypochlorous
 - B. chlorine and oxygen
 - C. oxygen and leaving behind aqueous hydrochloric acid
 - D. oxygen, hydrogen and chlorine
32. $\text{Cu}^{2+}_{(\text{aq})} + 4\text{NH}_{3(\text{g})} \rightleftharpoons [\text{Cu}(\text{NH}_3)_4]^{2+}_{(\text{aq})}$
 In the reaction above, what is the effect of precipitating $\text{Cu}^{2+}_{(\text{aq})}$ as $\text{CuS}_{(\text{aq})}$?
- A. More $\text{NH}_{3(\text{g})}$ will be generated
 - B. There will be no effect
 - C. $\text{NH}_{3(\text{g})}$ concentration will decrease
 - D. The equilibrium will shift to the right
33. Copper and silver metals are commonly used as coins because they are
- A. easily oxidized
 - B. not easily reduced
 - C. not easily oxidized
 - D. easily reduced

34.



In the diagram above, the respective activation energies for the catalyzed and uncatalyzed reactions in kJ are:

- A. 30 and 35
 - B. 40 and 45
 - C. 50 and 45
 - D. 45 and 50
35. The soft solder used for welding and plumbing is an alloy of
- A. iron and zinc
 - B. iron and tin
 - C. lead and tin
 - D. lead and zinc
36. A good drying agent should be
- A. hygroscopic
 - B. deliquescent
 - C. effervescent
 - D. efflorescent
37. A supersaturated solution is said to contain
- A. more solute than it can dissolve at that temperature in the presence of undissolved solute
 - B. as much solute as it can dissolve at that temperature
 - C. more solute than it can dissolve at that temperature
 - D. as much solute as it can dissolve at that temperature in the presence of undissolved solute
38. When temporary hard water is boiled for some time in a kettle, the inner surface of the kettle becomes coated with a deposit of
- A. aluminium trioxocarbonate(IV)

- B. calcium hydrogentrioxocarbonate(IV)
 C. calcium tetraoxosulphate(VI)
 D. calcium trioxocarbonate(IV)
39. What weight of NaCl is needed to make 2.0dm³ of a 1.5M solution?
 A. 175g B. 116g C. 87g D. 58g
 [Na = 23, Cl = 35.5]
40. Smog usually occurs over cities which
 A. have very few plants
 B. are surrounded by water
 C. burn a lot of fossil fuels
 D. are overpopulated
41. The presence of nitrogen in air is to slow down
 A. combustion and corrosion
 B. respiration and combustion
 C. respiration and transpiration
 D. corrosion and respiration
42. The oxidation state of oxygen in tetraoxosulphate (VI) acid is
 A. -4 B. -8 C. +4 D. -2
43. Tartaric acid is used industrially to
 A. remove rust
 B. make fruit juices
 C. make baking powder
 D. dry substances
44. $C_2H_4(g) + H_2(g) \rightarrow C_2H_6(g)$
 $\Delta H = -137kJ mol^{-1}$
 The reaction represented above is
 A. spontaneous B. in equilibrium
 C. endothermic D. exothermic
45. How long would it take to deposit 0.08g of copper from CuCl₂ solution by passing a current of 0.5A?
 A. 8 mins B. 48 mins
 C. 6 mins D. 24 mins
46. Calculate the number of moles of HCl present in 20cm³ of a 0.75M solution of the acid.
 A. 1.500 moles B. 0.015 mole
 C. 3.800 moles D. 0.038 mole
47. Dissolving some pellets of NaOH in water would result in
 A. an increase in the entropy of the solution
 B. a decrease in the free energy of the solution
 C. a lowering of the temperature of the solution
 D. a decrease in the entropy of the solution
48. The reaction that takes place in a Daniel cell is
 A. neutralization
 B. double decomposition
 C. direct combination
 D. redox
49. What happens when zinc rod is immersed in copper(II) tetraoxosulphate(VI) solution?
 A. The copper generates more copper ions
 B. Electrons flow from copper to zinc
 C. The blue colour of the solution disappears
 D. The zinc rod remains undissolved
50. The salt formed from a strong acid and a strong base is
 A. neutral B. complex C. acidic D. basic

UTM E 2007 Type L Solutions

1. Option C.
2. Option A.
3. Option D.
4. Option A.
5. Option D.
6. Option A.
7. Option B.
8. Option D.
9. Option C.
10. Option A.
11. Option D.
12. Option C.
13. Option A.
14. Option C.
15. Option C.
16. Option A.
17. Option D.
18. Option C.
19. Option A.
20. Option D.
21. Option A.
22. Option B.
23. Option B.
24. Option A.
25. Option D.
26. Option C.
27. Option D.
28. Option A.
29. Option D.
30. Option A.
31. Option C.
32. Option A.
33. Option C.
34. Option A.
35. Option C.
36. Option A.
37. Option A.
38. Option D.
39. Option A.

40. Option A.
41. Option B.
42. Option D.
43. Option C.
44. Option D.
45. Option A.
46. Option B.
47. Option B.
48. Option D.
49. Option C.
50. Option A.

UTM E 2008**Questions**

1. Chlorophyll obtained from green leaves of plant can be composed of more than one coloured component by the technique of
 - A. crystallization
 - B. hydrolysis
 - C. chromatography
 - D. sublimation
2. In countries where the temperature falls below 273 K, salt is always sprinkled in the icy roads in order to
 - A. lower the melting point of the ice
 - B. increase the density of the ice
 - C. make the ice impure
 - D. raise the melting point of the ice
3. $2\text{Na}_{(s)} + 2\text{H}_2\text{O}_{(l)} \rightarrow 2\text{NaOH}_{(aq)} + \text{H}_2\text{(g)}$

From the equation above, calculate the mass of sodium hydroxide produced by 2.3g of sodium

- A. 0.40g
 - B. 0.80g
 - C. 4.00g
 - D. 8.00g
4. 16.8g of sodium hydrogen trioxocarbonate(IV) is completely decomposed by heat. Calculate the

volume of carbon(IV) oxide given off at s.t.p.

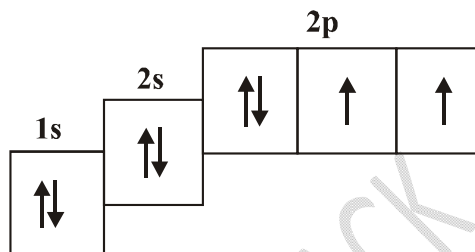
- A. 22.40dm^3 B. 11.20dm^3
C. 2.24dm^3 D. 1.12dm^3

[Na = 23, C = 12, O = 16, H = 1,

Molar volume of gas at s.t.p. = 22.4dm^3]

5. 300 cm^3 of a gas has a pressure of 800 mm Hg. If the pressure is reduced to 650 mm Hg, find its volume.
A. 243.75 cm^3 B. 369.23 cm^3
C. 738.46 cm^3 D. 1733.36 cm^3
6. Diffusion is slowest in solid particles than in particles of liquids and gases because
A. solid particles have more kinetic energy than the particles of liquids and gases.
B. solid particles have less kinetic energy than the particles of liquids and gases.
C. solid particles have less restrictions in their movement than liquid and gas particles.
D. the particles in solids are far apart and the cohesive forces between them are negligible.
7. The experiment that showed that atoms have tiny positively charged nucleus was first carried out by
A. Moseley B. Rutherford
C. Millikan D. Dalton
8. The atom of an element X is represented as ${}^Y_Z\text{X}$. The basic chemical properties of X depend on the value of
A. Y B. Z C. Y - Z D. Z - Y

9.



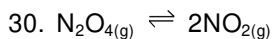
The diagram above represents the electron sub-level for

- A. carbon B. nitrogen
C. oxygen D. fluorine
10. In the Periodic Table, electrical and thermal conductivities are properties of elements that
A. decrease across the period and increase down the group.
B. increase across the period and decrease down the group.
C. Decrease across the period and down the group.
D. Increase across the period and down the group.
11. ${}^{23}_{11}\text{Na} + {}^1_0\text{n} \rightarrow {}^{24}_{11}\text{Na}$
The reaction above is an example of
A. nuclear fission B. nuclear fusion
C. artificial transmutation
D. beta decay.
12. Air boiled out of water as steam is richer in
A. nitrogen and oxygen
B. carbon (IV) oxide and oxygen
C. noble gases and carbon (IV) oxide
D. oxygen and noble gases.
13. In the course of purifying water for town supply, the water is passed through large settling tanks containing sodium aluminate (III) to remove
A. Large particles B. germs
C. fine particles D. odour.

14. When a few drops of water is added to a blue anhydrous cobalt (II) chloride, the colour changes to
A. white B. pink C. red D. blue
15. The vulcanizer's solution is prepared by dissolving rubber in
A. ethanol B. kerosene
C. benzene D. petrol
16. 117.0 g of sodium chloride was dissolved in 1.0 dm³ of distilled water at 25°C. Determine the solubility in mol dm⁻³ of sodium chloride at that temperature.
A. 1.0 B. 2.0 C. 3.0 D. 4.0
17. The uncovered raw food that is sold along major roads is likely to contain some amounts of
A. Pb B. Cu C. Ag D. Na
18. What is the pH of a 0.001 mol dm⁻³ solution of sodium hydroxide?
A. 14 B. 13 C. 12 D. 11
19. The basicity of CH₃COOH is
A. 1 B. 2 C. 3 D. 4
20. 0.05 mol dm⁻³ HCl is neutralized by 25 cm³ NaOH. If the volume of acid used is 32.00 cm³, what is the concentration of the base?
A. 0.016 mol dm⁻³ B. 0.032 mol dm⁻³
C. 0.039 mol dm⁻³ D. 0.064 mol dm⁻³
21. Insoluble salts can be prepared by
A. titrating an alkali against an appropriate acid.
B. reacting an acid with trioxocarbonate (IV) salt.
C. direct combination of the elements which make up the salt.
D. mixing two soluble compounds containing the metallic radical and the acidic radical.
22. The oxidation state of carbon in HCOOH is
A. -1 B. +2 C. +3 D. 0
23. What is the IUPAC nomenclature of the compound NaClO?
A. Sodium oxochlorate (I).
B. Sodium chloro (I) oxide.
C. Sodium monooxochlorate (II)
D. Sodium chloro (I) monoxide.
24. In recharging a lead-acid accumulator, the reaction at the cathode can be represented as
A. $\text{Pb}^{2+}_{(\text{aq})} + \text{SO}_4^{2-}_{(\text{aq})} \rightarrow \text{PbSO}_{4(\text{s})}$
B. $\text{Pb}^{2+}_{(\text{aq})} + 2\text{e}^- \rightarrow \text{Pb}_{(\text{s})}$
C. $\text{Pb}^{2+}_{(\text{aq})} + \text{H}_2\text{O}_{(\text{l})} \rightarrow \text{PbO}_{2(\text{s})} + 4\text{H}^+ + 4\text{e}^-$
D. $\text{Pb}_{(\text{s})} \rightarrow \text{Pb}^{2+}_{(\text{aq})} + 2\text{e}^-$
25. If a given quantity of electricity liberates 0.65g of Zn²⁺, what amount of Hg²⁺ would be liberated by the same quantity of current?
A. 1.00g B. 2.01g C. 4.02g D. 8.04g
26. $\text{NH}_3(\text{g}) + \text{HCl}(\text{g}) \rightarrow \text{NH}_4\text{Cl}(\text{s})$
The entropy change in the system above is
A. positive B. zero
C. negative D. indeterminate.
27. Which of the following reactions is endothermic?
A. $\text{C}_{(\text{s})} + \text{O}_{2(\text{g})} \rightarrow \text{CO}_{2(\text{g})}$
B. $\text{CaO}_{(\text{s})} + \text{H}_2\text{O}_{(\text{l})} \rightarrow \text{Ca}(\text{OH})_{2(\text{s})}$
C. $\text{C}_{(\text{s})} + \text{H}_2\text{O}_{(\text{l})} \rightarrow \text{CO}_{(\text{g})} + \text{H}_{2(\text{g})}$
D. $\text{HCl}_{(\text{aq})} + \text{NaOH}_{(\text{aq})} \rightarrow \text{NaCl}_{(\text{aq})} + \text{H}_2\text{O}_{(\text{l})}$
28. A catalyst speed up the rate of a chemical reaction by
A. taking part in the reaction
B. increasing the activation energy of the reaction
C. lowering the activation energy of the reaction
D. increasing the heat content.

29. The rate of a reaction usually decreases with a decrease in the concentration of reactants because

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



In the reaction above, the equilibrium constant is

- A. $\frac{[\text{NO}_2]}{[\text{N}_2\text{O}_4]}$ B. $\frac{[2\text{NO}_2]}{[\text{N}_2\text{O}_4]}$
 C. $\frac{[\text{N}_2\text{O}_4]}{[\text{NO}_2]}$ D. $\frac{[\text{NO}_2]^2}{[\text{N}_2\text{O}_4]}$

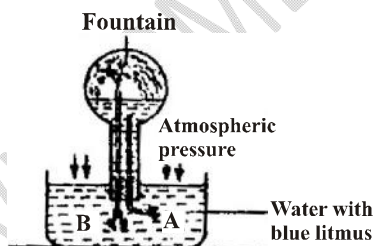
31. The substance that is used in the steel industry for the removal of carbon, sulphur and phosphorus impurities from pig iron is

- A. Oxygen B. chlorine
 C. nitrogen D. hydrogen

32. Which of the following compounds of trioxo(V) will decompose to give dinitrogen(I) oxide and water when heated?

- A. NaNO_3 B. $\text{Zn}(\text{NO}_3)_2$
 C. $\text{Cu}(\text{NO}_3)_2$ D. NH_4NO_3

Use the diagram below to answer questions 33 and 34.



33. The gas that can be used to demonstrate the experiment is

- A. hydrogen chloride
 B. hydrogen sulphide
 C. nitrogen(II) oxide

D. dinitrogen(I) oxide.

34. The colour of the fountain water is

- A. blue B. orange
 C. red D. yellow.

35. When a solution of ammonium trioxocarbonate(IV) is added to a solution of an unknown salt, a white precipitate which is soluble in dilute hydrochloric acid but insoluble in ethanoic acid is formed. This indicates the presence of

- A. Ca^{2+} B. Na^+ C. Zn^{2+} D. K^+

36. Lead is used for making bullets and lead shots because of its

- A. Resistance to corrosion
 B. Low melting point
 C. High density D. flexibility

37. Which of the following gives a precipitate when treated with NaOH solution?

- A. AlCl_3 B. NH_4Cl
 C. Na_2CO_3 D. CH_3COONa

38. The most common ores of iron include

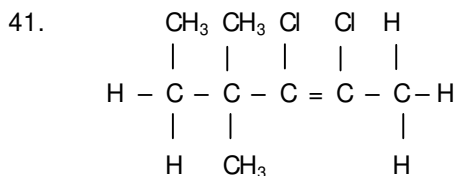
- A. haematite, malachite and limonite
 B. chalcocite, calamine and bornite
 C. magnetite, haematite and limonite
 D. malachite, chalcocite and bornite.

39. The type of isomerism shown by cis- and trans-isomers is

- A. optical isomerism
 B. positional isomerism
 C. functional isomerism
 D. geometrical isomerism.

40. If the silver mirror test is positive, it indicates the presence of an

- A. alkyne B. alkanol
 C. alkanone D. alkanal.



The IUPAC nomenclature for the structure above is

- A. 2,3-dichloro-4,4,5-trimethylpent-2-ene
 B. 4,5-dichloro-2,3-dimethylhex-2-ene.
 C. 2,3-dichloro-4,4-dimethylhex-2-ene
 D. 2,3-dichloro-2,2-dimethylhex-2-ene.

42. If glucose is heated with concentrated tetraoxosulphate(VI) acid, it will be dehydrated to

- A. carbon B. carbon(IV) oxide
 C. ethene D. ethanol

43. A hydrocarbon X with a molar mass of 26 consists of 92.3% carbon. What is its molecular formula?

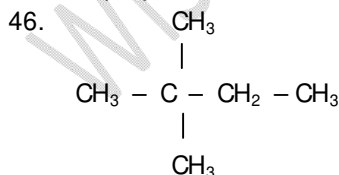
- A. C_2H_2 B. C_3H_3 C. C_4H_4 D. C_5H_5

44. A red precipitate of copper(I) carbide is formed when ammonium solution of copper(I) chloride is introduced into

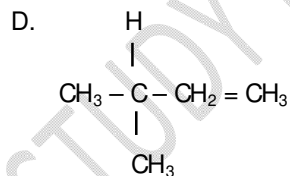
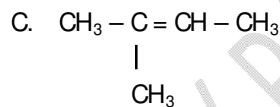
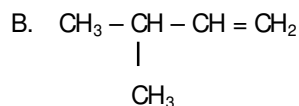
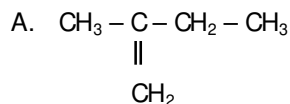
- A. $\text{CH}_2 = \text{CH} - \text{CH}_2 - \text{CH}_3$
 B. $\text{CH}_3 - \text{CH}_2 - \text{C} \equiv \text{CH}$
 C. $\text{CH}_3 - \text{CH}_2 - \text{CH}_2\text{CH}_3$
 D. $\text{CH}_3 - \text{C} \equiv \text{C} - \text{CH}_3$.

45. Reduction of nitroalkanes, nitrites and amides is a route for the preparation of

- A. amines B. alkenes
 C. polymers D. detergents



The major product of the dehydration of the above compound is



47. Reduction of alkanones with LiAlH_4 produces

- A. primary alkanols
 B. secondary alkanols
 C. tertiary alkanols
 D. polyhydric alkanols.

48. The product obtained when a mixture of benzene vapour and hydrogen are passed over a nickel catalyst at 180°C is

- A. cyclohexane B. cyclopentane
 C. n-hexane D. n-pentane

49. Polyvinyl chloride is used in the production of

- A. glass B. alloy
 C. pipes D. ceramics.

50. Detergents are manufactured with straight hydrocarbon chains so as to make them

- A. soluble B. biodegradable
 C. cheaper D. foamy.

UTME 2008 Answers

1. Option C.
2. Option A.
3. Option C.
4. Option C.
5. Option B.
6. Option B.
7. Option B.
8. Option B.
9. Option C.
10. Option A.
11. Option C.
12. Option C.
13. Option C.
14. Option B.
15. Option C.
16. Option B.
17. Option A.
18. Option D.
19. Option A.
20. Option D.
21. Option D.
22. Option B.
23. Option A.
24. Option D.
25. Option B.
26. Option B.
27. Option B.
28. Option C.
29. Option D.
30. Option D.
31. Option A.
32. Option D.
33. Option A.
34. Option C.
35. Option A.
36. Option C.
37. Option A.
38. Option C.
39. Option D.

40. Option D.
41. Option C.
42. Option A.
43. Option A.
44. Option B.
45. Option A.
46. Option C.
47. Option B.
48. Option A.
49. Option C.
50. Option B.

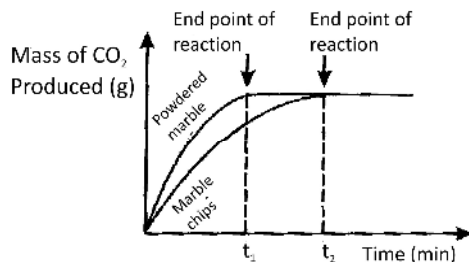
UTME 2010 Questions - TYPE A

1. Which Chemistry Question Paper Type is given to you?
(A) Type A (B) Type B
(C) Type C (D) Type D
2. Which of the following is an example of a mixture?
(A) Common salt (B) Blood
(C) Sand (D) Washing soda
3. Calculate the percentage by mass of nitrogen in calcium trioxonitrate(V).
(A) 8.5% (B) 13.1%
(C) 17.1% (D) 27.6%
(Ca = 40; N = 14; O = 16).
4. The droplets of water observed around a bottle of milk taken out of the refrigerator is due to the fact that the
(A) water vapour in the air around the bottle gains some energy from the bottle.
(B) temperature of the milk drops as it loses heat to the surroundings.
(C) saturated vapour pressure of the milk is equal to the atmospheric pressure.

- (D) water vapour in the air around the bottle loses some of its energy to the bottle.
5. The volume of a given gas is $V \text{ cm}^3$ at P mmHg. What is the new volume of the gas if the pressure is reduced to half at constant temperature?
 (A) $4V \text{ cm}^3$ (B) $2V \text{ cm}^3$
 (C) $\frac{V}{2} \text{ cm}^3$ (D) $V \text{ cm}^3$.
6. Moving from left to right across a period, the general rise in the first ionization energy can be attributed to the
 (A) decrease in nuclear charge
 (B) increase in nuclear charge
 (C) decrease in screening effect
 (D) increase in screening effect.
7. How many unpaired electron(s) are there in the nitrogen sub-levels?
 (A) 3 (B) 2 (C) 1 (D) 0
8. The stability of the noble gases is due to the fact that they
 (A) have no electron in their outermost shells.
 (B) have duplet or octet electron configurations.
 (C) belong to group zero of the Periodic Table.
 (D) are volatile in nature.
9. The maximum number of electrons in the L shell of an atom is
 (A) 2 (B) 8 (C) 18 (D) 32.
10. Elements in the same period in the Periodic Table have the same
 (A) number of shells
 (B) atomic number
 (C) chemical properties
 (D) physical properties.
11. ${}^2_1D + {}^3_1T \rightarrow {}^4_2He + {}^1_0n + \text{Energy}$
- The reaction above illustrates
 (A) alpha decay
 (B) artificial transmutation
 (C) nuclear fusion
 (D) nuclear fission.
12. A noble gas with a high power of fog penetration used in aerodrome beacons is
 (A) krypton (B) argon
 (C) helium (D) neon.
13. Permanent hardness of water can be removed by
 (A) filtration
 (B) adding slaked lime
 (C) adding caustic soda
 (D) boiling.
14. Substances employed as drying agents are usually
 (A) amphoteric (B) hygroscopic
 (C) efflorescent (D) acidic
15. Calculate the solubility in mol dm^{-3} of 40g of CuSO_4 dissolved in 100g of water at 120°C .
 (A) 4.00 (B) 2.50 (C) 0.40 (D) 0.25
 [Cu = 64, S = 32, O = 16]
16. Coffee can best be removed by
 (A) kerosine
 (B) turpentine
 (C) a solution of borax in water
 (D) ammonia solution.
17. Carbon (II) oxide is considered dangerous if inhaled mainly because it
 (A) can cause injury to the nervous system
 (B) competes with the oxygen in the blood
 (D) competes with the carbon (IV) oxide in the blood
 (E) can cause lung cancer.
18. The acid that is used to remove rust is

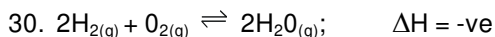
- (A) boric
 (B) hydrochloric
 (C) trioxonitrate(V)
 (D) tetraoxosulphate(VI)
19. Calculate the volume of 0.5 mol dm^{-3} H_2SO_4 that is neutralized by 25 cm^3 of 0.1 mol dm^{-3} NaOH .
 (A) 5.0 cm^3 (B) 2.5 cm^3
 (C) 0.4 cm^3 (D) 0.1 cm^3
20. The colour of methyl orange in alkaline medium is
 (A) yellow (B) pink
 (C) orange (D) red.
21. Which of the following salts is slightly soluble in water?
 (A) AgCl (B) CaSO_4
 (C) Na_2CO_3 (D) PbCl_2
22. $6\text{AgNO}_{3(\text{aq})} + \text{PH}_{3(\text{g})} + 3\text{H}_2\text{O}_{(\text{l})}$
 \downarrow
 $6\text{Ag}_{(\text{s})} + \text{H}_3\text{PO}_{3(\text{aq})} + 6\text{HNO}_{3(\text{aq})}$
 In the reaction above, the reducing agent is
 (A) $\text{HNO}_{3(\text{aq})}$ (B) $\text{H}_2\text{O}_{(\text{l})}$
 (C) $\text{PH}_{3(\text{g})}$ (D) $\text{PbNO}_{3(\text{aq})}$
23. The IUPAC nomenclature of the compound LiAlH_4 is
 (A) lithium tetrahydridoaluminatate (III)
 (B) aluminium tetrahydrido lithium
 (C) tetrahydrido lithium aluminatate (III)
 (D) lithium aluminium hydride
24. Iron can be protected from corrosion by coating the surface with
 (A) gold (B) silver
 (C) copper (D) zinc
25. What quantity of aluminium is deposited when a current of 10 A is passed through a solution of an aluminium salt for 1930 s ?
 (A) 0.2 g (B) 1.8 g
 (C) 5.4 g (D) 14.2 g
 [$\text{Al} = 27, \text{F} = 96,500 \text{ C mol}^{-1}$]
26. In which of the following is the entropy change positive?
 (A) Thermal dissociation of ammonium chloride.
 (B) Reaction between an acid and a base.
 (C) Addition of concentrated acid to water.
 (D) Dissolution of sodium metal in water.
27. If a reaction is exothermic and there is a great disorder, it means that
 (A) the reaction is static
 (B) the reaction is in a state of equilibrium
 (C) there will be a large increase in free energy
 (D) there will be a large decrease in free energy
28. In the preparation of oxygen by heating KClO_3 in the presence of MnO_2 , only moderate heat is needed because the catalyst acts by
 (A) lowering the pressure of the reaction
 (B) increasing the surface area of the reactant
 (C) increasing the rate of the reaction
 (D) lowering the energy barrier of the reaction.

29.



The graph above demonstrates the effect of

- (A) surface area on the rate of reaction
- (B) catalyst on the rate of reaction
- (C) pressure on the rate of reaction
- (D) concentration on the rate of reaction.



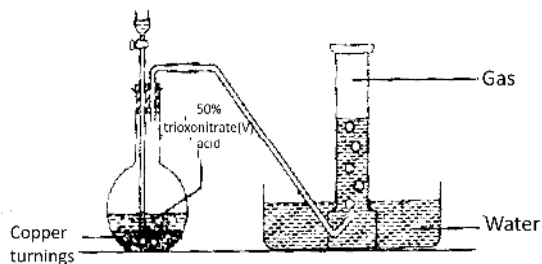
What happens to the equilibrium constant of the reaction above if the temperature is increased?

- (A) It is unaffected.
- (B) It becomes zero.
- (C) It decreases.
- (D) It increases.

31. To a solution of an unknown compound, a little dilute tetraoxosulphate(VI) acid was added with some freshly prepared iron(II) tetraoxosulphate(VI) solution. The brown ring observed after the addition of a stream of concentrated tetraoxosulphate(VI) acid confirmed the presence of

- (A) CO_3^{2-}
- (B) Cl^-
- (C) SO_3^{2-}
- (D) NO_3^-

32.



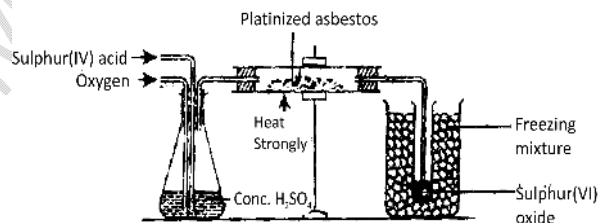
In the diagram above, the gas produced is

- (A) NO
- (B) NO₂
- (C) N₂O
- (D) N₂O₄

33. Which of the following is used as a rocket fuel?

- (A) HNO₃
- (B) CH₃COOH
- (C) H₂SO₄
- (D) HCl

34.



In the diagram above, the purpose of the asbestos is to

- (A) absorb impurities
- (B) catalyze the reaction
- (C) solidify the gas
- (D) dry the gas

35. A constituent common to bronze and solder is

- (A) lead
- (B) silver
- (C) copper
- (D) tin.

36. When iron is exposed to moist air, it gradually rusts. This is due to the formation of

- (A) hydrated iron(III) oxide
- (B) anhydrous iron(III) oxide

- (C) anhydrous iron(II) oxide
(D) hydrated iron(II) oxide
37. A compound gives an orange-red colour to a non-luminous flame. This compound is likely to contain
(A) Na^+ (B) Ca^{2+} (C) Fe^{3+} (D) Fe^{2+}
38. Stainless steel is used for making
(A) magnets
(B) tools
(C) coins and medals
(D) moving parts of clocks.
39. The residual solids from the fractional distillation of petroleum are used as
(A) coatings for pipes
(B) raw materials for the cracking process
(C) fuel for driving tractors
(D) fuel for jet engines.
40. $\text{CH}_3(\text{CH}_2)_3\text{CHC}_2\text{H}_5$
 $\begin{array}{c} | \\ \text{C}_3\text{H}_7 \end{array}$
 The IUPAC nomenclature of the compound above is
(A) 4-ethyloctane
(B) 5-ethyloctane
(C) 5-propylheptane
(D) 3-propylheptane
41. Which of the following is used as fuel in miners' lamp?
(A) Ethanal (B) Ethyne
(C) Ethene (D) Ethane.
42. Which of the following organic compounds is very soluble in water?
(A) CH_3COOH (B) C_2H_2
(C) C_2H_4 (D) $\text{CH}_3\text{COOC}_2\text{H}_5$
43. Benzene reacts with hydrogen in the presence of nickel catalyst at 180°C to give
(A) xylene (B) toluene
(C) cyclopentane (D) cyclohexane.
44. Which of the following is used to hasten the ripening of fruits?
(A) Ethene (B) Ethanol
(C) Ethyne (D) Ethane.
45. The final products of the reaction between methane and chlorine in the presence of ultraviolet light are hydrogen chloride and
(A) trichloromethane
(B) dichloromethane
(C) tetrachloromethane
(D) chloromethane.
46. The correct order of increasing boiling points of the following compounds $\text{C}_3\text{H}_7\text{OH}$, C_7H_{16} and C_4H_{10} is
(A) $\text{C}_3\text{H}_7\text{OH} \rightarrow \text{C}_4\text{H}_{10} \rightarrow \text{C}_7\text{H}_{16}$
(B) $\text{C}_4\text{H}_{10} \rightarrow \text{C}_7\text{H}_{16} \rightarrow \text{C}_3\text{H}_7\text{OH}$
(C) $\text{C}_7\text{H}_{16} \rightarrow \text{C}_3\text{H}_7\text{OH} \rightarrow \text{C}_4\text{H}_{10}$
(D) $\text{C}_4\text{H}_{10} \rightarrow \text{C}_3\text{H}_7\text{OH} \rightarrow \text{C}_7\text{H}_{16}$
47. One of the major uses of alkanes is
(A) as domestic and industrial fuels
(B) in the hydrogenation of oils
(C) in the textile industries
(D) in the production of plastics.
48. The haloalkanes used in the dry-cleaning industries are
(A) trichloromethane and tetrachloromethane
(B) chloroethene and dichloroethene
(C) trichloroethene and tetrachloroethene
(D) chloroethane and dichloroethene.
49. Two hydrocarbons X and Y were treated with bromine water. X decolourized the solution and Y did not. Which class of compounds does Y belong?
(A) Benzene (B) Alkynes
(C) Alkenes (D) Alkanes.
50. The compound that is used as an anaesthetic is

- (A) CCl_4 (B) CHCl_3
(C) CH_2Cl_2 (D) CH_3Cl

UTME 2010 Answers

- Option A.
- Option B.
- Option C.
- Option D.
- Option B.
- Option B.
- Option A.
- Option B.
- Option B.
- Option A.
- Option C.
- Option D.
- Option B.
- Option B.
- Option B.
- Option C.
- Option B.
- Option B.
- Option B.
- Option B.
- Option A.
- Option B.
- Option C.
- Option A.
- Option D.
- Option B.
- Option A.
- Option D.
- Option A.
- Option C.
- Option D.
- Option A.
- Option A.
- Option B.
- Option D.

- Option A.
- Option B.
- Option B.
- Option A.
- Option A.
- Option B.
- Option A.
- Option D.
- Option A.
- Option C.
- Option B.
- Option A.
- Option A.
- Option D.
- Option B.

UTME 2012

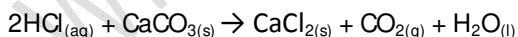
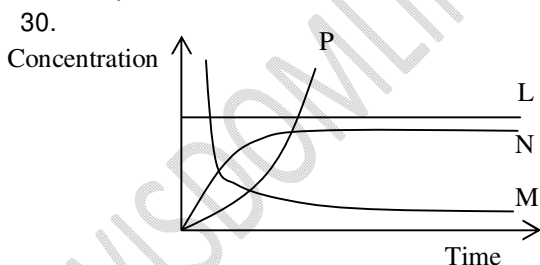
Questions - Type Green

- Which Question Paper Type of Chemistry as indicated above is given to you?
 - Type Green
 - Type Purple
 - Type Red
 - Type Yellow
- Which of the following methods can be used to obtain pure water from a mixture of sand, water and methanoic acid?
 - Neutralization with NaOH followed by filtration
 - Neutralization with NaOH followed by distillation
 - Fraction distillation
 - Filtration followed by distillation
- How many atoms are present in 6.0g of magnesium?
 - 1.20×10^{22}
 - 2.41×10^{22}

- C. 1.51×10^{23} D. 3.02×10^{23}
4. 50cm^3 of a gas was collected over water at 10°C and 765 mm Hg. Calculate the volume of the gas at s.t.p. if the saturated vapour pressure of water at 10°C is 5 mm Hg.
 A. 49.19cm^3 B. 48.87cm^3
 C. 48.55cm^3 D. 48.23cm^3
5. An increase in the pressure exerted on a gas at a constant temperature results in
 A. a decrease in the number of effective collisions
 B. a decrease in volume
 C. an increase in the average intermolecular distance
 D. an increase in volume
6. $2\text{H}_{2(\text{g})} + \text{O}_{2(\text{g})} \rightarrow 2\text{H}_2\text{O}_{(\text{g})}$
 In the reaction above, what volume of hydrogen would be left over when 300cm^3 of oxygen and 1000cm^3 of hydrogen are exploded in a sealed tube?
 A. 200cm^3 B. 400cm^3
 C. 600cm^3 D. 700cm^3
7. **I. Evaporation.**
II. Sublimation.
III. Diffusion.
IV. Brownian motion.
 Which of the above can correctly be listed as evidences for the particulate nature of matter?
 A. I and III only B. II and IV only
 C. I, II and III only D. I, II, III and IV
8. If the elements X and Y have atomic numbers 11 and 17 respectively, what type of bond can they form?
 A. Dative B. Covalent
 C. Ionic D. Metallic
9. A deuterium atom which has lost an electron contains
 A. one proton only
 B. one neutron only
 C. one proton and one neutron
 D. one proton, one electron and one neutron
10. The electronic configuration of Mg^{2+} is
 A. $1s^2 2s^2 2p^6 3s^2 3p^2$
 B. $1s^2 2s^2 2p^6 3s^2$
 C. $1s^2 2s^2 2p^6$ D. $1s^2 2s^2 2p^4$
11. Group VII elements are
 A. monoatomic
 B. good oxidizing agents
 C. highly electropositive
 D. electron donors.
12. Which of the following is used to study the arrangement of particles in crystal lattices?
 A. Alpha-particles B. Beta-particles
 C. Gamma-rays D. X-rays
13. **I. It has a varied composition from one place to another.**
II. Its constituents can be separated by physical means.
III. It contains unreactive noble gases.
 Which of the above shows that air is a mixture?
 A. I and II only B. II and III only
 C. I and III only D. I, II and III
14. The chemicals used to soften hard water involves the addition of
 A. insoluble sodium compounds which form soluble solutions of calcium and magnesium ions
 B. soluble sodium compounds which form soluble solutions of calcium and magnesium ions
 C. soluble sodium compounds which form insoluble precipitates of calcium and magnesium ions

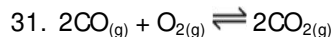
- D. insoluble sodium compounds which form insoluble precipitates of calcium and magnesium ions.
15. Chlorination of water for town supply is carried out to
- make the water colourless
 - remove germs from the water
 - make the water tasteful
 - remove odour from the water.
16. The solubilities of different solutes in a given solvent can be compared by
- plotting their solubility curves on separate axes
 - plotting their solubility curves on the same axes
 - plotting some of the solubility curves on the x-axis and others on the y-axis
 - plotting their solubility curves on the x-axis only.
17. Potassium trioxochlorate(V) has a solubility of 1.5 mol dm^{-3} at 45°C . On cooling this solution to a temperature of 20°C , the solubility was found to be 0.5 mol dm^{-3} . What mass of KClO_3 was crystallized out?
- 1.00 g
 - 10.00 g
 - 12.25 g
 - 122.50 g
18. Which of the following pollutants is associated with brain damage?
- Carbon (II) oxide
 - Radioactive fallout
 - Biodegradable waste
 - Sulphur (IV) oxide
19. Which of the following will produce a solution with pH less than 7 at equivalent point?
- $\text{HNO}_3 + \text{NaOH}$
 - $\text{H}_2\text{SO}_4 + \text{KOH}$
 - $\text{HCl} + \text{Mg}(\text{OH})_2$
 - $\text{HNO}_3 + \text{KOH}$
20. The number of hydroxonium ions produced by one molecule of an acid in aqueous solution is its
- basicity
 - acid strength
 - pH
 - concentration
21. During a titration experiment, 0.05 mole of carbon(IV)oxide is liberated. What is the volume of gas liberated?
- 22.40 dm^3
 - 11.20 dm^3
 - 2.24 dm^3
 - 1.12 dm^3
- [Molar Volume of gas at s.t.p. = 22.4 dm^3]
22. A major factor considered in selecting a suitable method for preparing a simple salt is its
- crystalline form
 - melting point
 - reactivity with dilute acids
 - solubility in water.
23. The oxidation number of boron in NaBH_4 is
- 3
 - 1
 - +1
 - +3
24. $2\text{Na}_2\text{O}_{2(\text{s})} + 2\text{H}_2\text{O}_{(\text{l})} \rightarrow 4\text{NaOH}_{(\text{s})} + \text{O}_{2(\text{g})}$
The substance that is oxidized in the reaction above is
- $2\text{Na}_2\text{O}_{2(\text{s})}$
 - $\text{NaOH}_{(\text{aq})}$
 - $\text{H}_2\text{O}_{(\text{l})}$
 - $\text{O}_{2(\text{g})}$
25. What number of moles of Cu^{2+} will be deposited by 360 coulombs of electricity?
- 5.36×10^{-4} mole
 - 1.87×10^{-3} mole
 - 9.35×10^{-4} mole
 - 3.73×10^{-3} mole
- [$F = 96500 \text{ C mol}^{-1}$]
26. A metal M displaces zinc from ZnCl_2 solution. This shows that
- electrons flow from zinc to M.
 - M is more electropositive than zinc

- C. M is more electronegative than zinc
 D. zinc is more electropositive than M.
27. $\text{CO}_{(g)} + \text{H}_2\text{O}_{(g)} \rightarrow \text{CO}_{2(g)} + \text{H}_2(g)$
 Calculate the standard heat change of the reaction above, if the standard enthalpies of formation of $\text{CO}_{2(g)}$, $\text{H}_2\text{O}_{(g)}$ and $\text{CO}_{(g)}$ in kJ mol^{-1} are -394, -242 and -110 respectively.
 A. $+262 \text{ kJ mol}^{-1}$ B. -262 kJ mol^{-1}
 C. $+42 \text{ kJ mol}^{-1}$ D. -42 kJ mol^{-1}
28. An increase in entropy can best be illustrated by
 A. mixing of gases
 B. freezing of water
 C. the condensation of vapour
 D. solidifying candle wax.
29. The highest rate of production of carbon(IV)oxide can be achieved using
 A. 0.05 mol dm^{-3} HCl and 5g powdered CaCO_3
 B. 0.05 mol dm^{-3} HCl and 5g lump CaCO_3
 C. 0.10 mol dm^{-3} HCl and 5g powdered CaCO_3
 D. $0.025 \text{ mol dm}^{-3}$ HCl and 5g powdered CaCO_3



From the reaction above, which of the curves represents the production of CO_2 gas as dilute HCl is added?

- A. L B. M C. N D. P



In the reaction above, high pressure will favour the forward reaction because

- A. high pressure favours gas formation
 B. the reaction is in dynamic equilibrium
 C. the reaction is exothermic
 D. the process occurs with a decrease in volume
32. A piece of filter paper moistened with lead(II)ethanoate solution turns black when the paper is dropped into a gas jar containing an unknown gas. The gas is likely to be
 A. sulphur(IV)oxide
 B. hydrogen chloride
 C. sulphur(VI)oxide
 D. hydrogen sulphide
33. Which of the following gases has a characteristic pungent smell, turns red litmus paper blue and forms dense white fumes with hydrogen chloride gas?
 A. N_2 B. N_2O C. Cl_2 D. NH_3
34. Commercial bleaching can be carried out using
 A. sulphur(IV)oxide and ammonia
 B. hydrogen sulphide and chlorine
 C. chlorine and sulphur (IV) oxide
 D. ammonia and chlorine
35. Mineral acids are usually added to commercial hydrogen peroxide to
 A. oxidize it
 B. decompose it
 C. minimize its decomposition
 D. reduce it to water and oxygen
36. Which of the following compounds will burn with a brick-red colour in a non-luminous Bunsen flame?

- A. LiCl B. NaCl C. CaCl₂ D. MgCl₂
37. The purest form of iron which contains only about 0.1% carbon is
A. pig iron B. wrought iron
C. cast iron D. iron pyrite
38. A common characteristic between zinc and the other transition elements is the ability to
A. have variable oxidation states
B. form complex ions
C. act as a catalyst
D. form coloured ions
39. Which of the following metals is the least reactive?
A. Pb B. Sn C. Hg D. Au
40. Geometric isomerism can exist in
A. hex-3-ene B. hexane
C. prop-1-ene
D. 3-methylbut-1-ene
41. Alkanals can be distinguished from alkanones by the reaction with
A. sudan III stain
B. starch iodide paper
C. lithium tetrahydrido aluminate (III)
D. Fehling's solution
42. The isomers of C₃H₈O are
A. 1-propanol and 2-propanol
B. 1-propanol and 1-propanol
C. 2-propanol and 2-propanone
D. 2-propanol and 1-propanol
43. Carbohydrates are large molecules with the molecular formula C_x(H₂O)_y. In which of the following pairs is x not equal to y?
A. Glucose and starch
B. Maltose and fructose
C. Sucrose and fructose
D. Maltose and starch
44. A compound contains 40.0% C, 6.7% H and 53.3% O. If the molecular mass of the compound is 180, its molecular formula is
A. CH₂O B. C₃H₆O₃ C. C₆H₆O₃
D. C₆H₁₂O₆
45. The alkyne that will give a white precipitate with silver trioxonitrate(V) is
A. CH₃CH₂C≡CCH₂CH₃
B. CH₃C≡CCH₂CH₂CH₃
C. CH₃CH₂CH₂CH₂C≡CH
D. CH₃CH₂CH₂C≡CCH₂CH₃
46. The saponification of an alkanoate to produce soap and alkanol involves
A. dehydration B. esterification
C. hydrolysis D. oxidation
47. 2-methylpropan-2-ol is an example of a
A. primary alkanol
B. secondary alkanol
C. tertiary alkanol
D. quaternary alkanol
48. The final oxidation product of alkanol, alkanal and alkanones is
A. alkanonic acid
B. alkanoyl halide
C. alkanoate
D. alkanamide
49. Ethanol reacts with concentrated tetraoxosulphate(VI) acid at a temperature above 170°C to form
A. ethanone B. ethane
C. ethyne D. ethanal
50. An example of oxidation-reduction enzyme is
A. amylase B. protease
C. lipase D. dehydrogenase

UTM E 2012 Answers

- Option A.
- Option D.
- Option C.

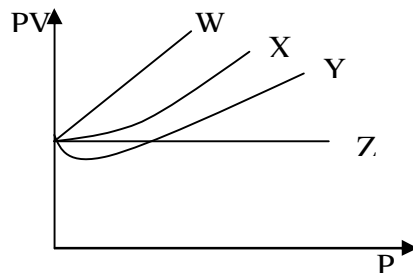
4. Option B.
5. Option B.
6. Option B.
7. Option D.
8. Option C.
9. Option C.
10. Option C.
11. Option B.
12. Option D.
13. Option A.
14. Option C.
15. Option B.
16. Option B.
17. Option D.
18. Option A.
19. Option B.
20. Option A.
21. Option D.
22. Option D.
23. Option D.
24. Option C.
25. Option B.
26. Option B.
27. Option D.
28. Option A.
29. Option C.
30. Option A.
31. Option D.
32. Option D.
33. Option D.
34. Option C.
35. Option C.
36. Option C.
37. Option B.
38. Option B.
39. Option D.
40. Option A.
41. Option D.
42. Option A.
43. Option D.

44. Option D.
45. Option C.
46. Option C.
47. Option C.
48. Option A.
49. Option B.
50. Option D.

2013 UTME Chemistry

Questions – Type U

1. Which Question Paper Type of Chemistry is given to you?
 - A. Type D
 - B. Type I
 - C. Type B
 - D. Type U.
2. The presence of an impurity in a substance will cause the melting point to
 - A. increase
 - B. be stable
 - C. be zero
 - D. reduce.
3. What volume of carbon (II) oxide is produced by reacting excess carbon with 10dm^3 of oxygen?
 - A. 15dm^3
 - B. 10dm^3
 - C. 5dm^3
 - D. 20dm^3
- 4.

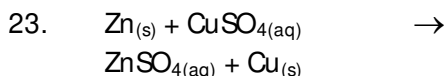


- From the diagram above, an ideal gas is represented by
- A. X
B. Y
C. Z
D. W.
5. The rate of diffusion of gas Y is twice that of Z. If the relative molecular mass of Y is 64 and the two gases diffuse under the same conditions, find the relative molecular mass of Z.
- A. 8
B. 16
C. 32
D. 256.
6. The radioisotope used in industrial radiography for the rapid checking of faults in welds and casting is
- A. cobalt-60
B. iodine-131
C. carbon-14
D. phosphorus-32
7. How many unpaired electrons are in the p-orbitals of a fluorine atom?
- A. 1
B. 2
C. 3
D. 0.
8. The radioactive emission with the least ionization power is
- A. γ -rays
B. β -particles
C. α -particles
D. X-rays
9. The shape of the carbon (IV) oxide molecule is
- A. angular
B. tetrahedral
C. pyramidal
D. linear.
10. Which of the following molecules is held together by hydrogen bond?
- A. H_2SO_4
B. HF
C. CH_4
D. HBr
11. The bond formed between two elements with electron configurations $1s^2 2s^2 2p^6 3s^2$ and $1s^2 2s^2 2p^4$ is
- A. dative
B. ionic
C. metallic
D. covalent.
12. The constituent of air that acts as a diluent is
- A. noble gases
B. oxygen
C. nitrogen
D. carbon (IV) oxide
13. Steam changes the colour of anhydrous cobalt (II) chloride from
- A. blue to pink
B. white to blue
C. white to red
D. blue to white.
14. An example of a hygroscopic substance is
- A. $\text{CaCl}_{2(s)}$

- B. $\text{NaOH}_{(s)}$
 C. $\text{CuO}_{(s)}$
 D. $\text{MgCl}_{2(s)}$
15. If 24.4g of lead (II) trioxonitrate (V) were dissolved in 42g of distilled water at 20°C , calculate the solubility of the solute in gdm^{-3} .
 A. 5.810
 B. 58.100
 C. 581.000
 D. 0.581.
16. The solvent used for removing grease stain is
 A. ethanol
 B. solution of borax in water
 C. turpentine
 D. ammonia solution.
17. In a water body, too much sewage leads to
 A. an increase in the bacterial population which reduced the level of oxygen in the water
 B. a decrease in the bacterial population which increases the level of oxygen in the water
 C. a decrease in the temperature of the water which causes death of aquatic animals
 D. an increase in the number of aquatic animals in the water.
18. 10.0dm^3 of water was added to 2.0mol dm^{-3} of 2.5dm^3 solution of HCl. What is the concentration of the final solution in mol dm^{-3} ?
 A. 2.0
 B. 0.5
 C. 0.4
 D. 8.0
19. Three drops of a 1.0mol dm^{-3} solution of HCl was added to 20cm^3 of a solution of pH 6.4. The pH of the resulting solution will be
 A. greater than 6.4
 B. unaltered
 C. close to that of pure water
 D. less than 6.4
20. Which of the following substances is not a salt?
 A. Sodium trioxocarbonate (IV)
 B. Zinc chloride
 C. Aluminium oxide
 D. Sodium hydrogentrioxosulphate (IV)
21. An insoluble salt can be prepared by
 A. the action of dilute acid on an insoluble base
 B. the reaction of metals with an acid
 C. the reaction of trioxocarbonate (IV) with an acid
 D. double decomposition.
22. $2\text{H}_2\text{O}_{(l)} + 2\text{F}_{2(g)} \rightarrow 4\text{HF}_{(aq)} + \text{O}_{2(g)}$

In the reaction above, the substance that is being reduced is

- A. $F_{2(g)}$
- B. $HF_{(aq)}$
- C. $O_{2(g)}$
- D. $H_2O_{(l)}$



In the reaction above, the oxidizing agent is

- A. $Cu_{(s)}$
- B. $Zn_{(s)}$
- C. $CuSO_{4(aq)}$
- D. $ZnSO_{4(aq)}$

24. In an electrochemical cell, polarization is caused by

- A. tetraoxosulphate (VI) acid
- B. hydrogen
- C. chlorine
- D. oxygen.

25. Calculate the volume in cm^3 of oxygen evolved at s.t.p. when a current of 5A is passed through acidified water for 193s.

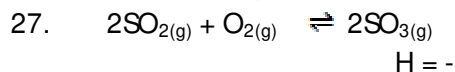
- A. 0.224
- B. 56.000
- C. 224.000
- D. 0.056.

[$F = 96,500 \text{ Cmol}^{-1}$, Molar volume of a gas at s.t.p. = 22.4 dm^3]

26. In an endothermic reaction, if there is a loss in entropy, the reaction will

- A. not be spontaneous
- B. be at equilibrium
- C. be indeterminate

D. be spontaneous.



$395.7 \text{ kJ mol}^{-1}$

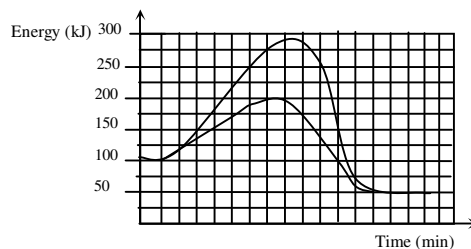
In the reaction above, the concentration of $SO_{3(g)}$ can be increased by

- A. increasing the temperature
- B. the addition of catalyst
- C. decreasing the pressure
- D. decreasing the temperature

28. The minimum amount of energy required for a reaction to take place is

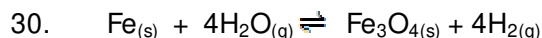
- A. activation energy
- B. kinetic energy
- C. lattice energy
- D. ionization energy.

29.



In the graph above, the activation energy of the catalyzed reaction is

- A. 250kJ
- B. 200kJ
- C. 100kJ
- D. 300kJ



- The equilibrium constant K of the reaction above is represented as
- A. $\frac{[H_2]^4}{[H_2O]^4}$
- B. $\frac{[Fe]^2[H_2O]^4}{[Fe_3O_4][H_2]^4}$
- C. $\frac{[Fe_3O_4][H_2]}{[Fe][H_2O]}$
- D. $\frac{[H_2O]^4}{[H_2]^4}$
31. Which of the following compounds is a neutral oxide?
- A. Sulphur (IV) oxide.
- B. Carbon (II) oxide.
- C. Carbon (IV) oxide.
- D. Sulphur (VI) oxide.
32. In the laboratory preparation of ammonia, the flask is placed in a slanting position so as to
- A. enhance the speed of the reaction
- B. prevent formation of precipitate
- C. prevent condensed water from breaking the reaction flask
- D. enable the proper mixing of the reactants in the flask.
33. Which of the following gases is employed as an anaesthesia?
- A. NH_3
- B. NO
- C. N_2O
- D. NO_2
34. Sulphur (IV) oxide is a strong reducing agent in the presence of water due to the formation of
- A. hydrogen sulphide
- B. trioxosulphate (IV) ion
- C. hydroxide ion
- D. sulphur (VI) oxide.
35. A metal that forms soluble trioxosulphate (IV) salt is
- A. manganese
- B. aluminium
- C. barium
- D. potassium.
36. Copper is displaced from the solution of its salts by most metals because it
- A. is a transition element
- B. has completely filled 3d-orbitals
- C. is at the bottom of the activity series
- D. is very reactive.
37. The coloured nature of transition metal ions are associated with their partially filled
- A. p-orbital
- B. d-orbital
- C. f-orbital
- D. s-orbital
38. Aluminium containers are frequently used to transport trioxonitrate (V) acid because aluminium
- A. does not corrode
- B. has a silvery-white appearance
- C. has a low density
- D. does not react with the acid.

39. 2-methylbutan-2-ol is an example of a

- A. secondary alkanol
- B. tertiary alkanol
- C. dihydric alkanol
- D. primary alkanol

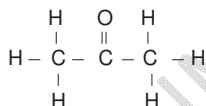
40. The reaction between ammonia and ethyl ethanoate produces

- A. ethanol and propanamide
- B. ethanol and ethanamide
- C. propanol and ethanamide
- D. propanol and propanamide.

41. The decarboxylation of ethanoic acid will produce carbon (IV) oxide and

- A. propane
- B. butane
- C. methane
- D. ethane.

42.



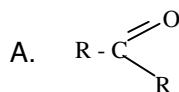
The compound above is an

- A. alkanal
- B. alkanol
- C. alkanone
- D. alkanoate.

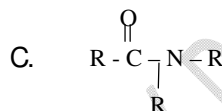
43. The compound that will react with sodium hydroxide to form salt and water only is

- A. $\text{CH}_3\text{CH}=\text{CH}_2$
- B. $\text{CH}_3\text{CH}_2\text{COOH}$
- C. $\text{C}_6\text{H}_{12}\text{O}_6$
- D. $(\text{CH}_3)_3\text{COH}$

44. Which of the following compounds in solution will turn red litmus paper blue?

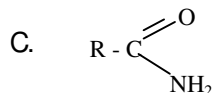
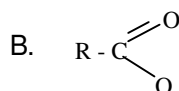
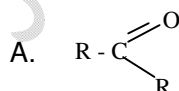


B. $\text{R}'\text{OR}''$



D. RNH_2

45. The dehydration of ammonium salt of alkanolic acids produces a compound with the general formula



D. R-NH_2

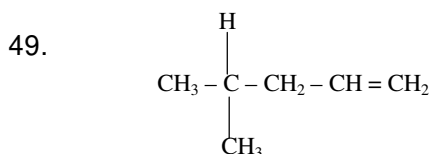
46. Which of the following fractions is used as raw material for the cracking process?

- A. Bitumen.
- B. Diesel oils.
- C. kerosene.
- D. Lubricating oils.

47. An organic compound with a pleasant smell is likely to have a general formula

- A. $\text{C}_n\text{H}_{2n+1}\text{COOC}_n\text{H}_{2n+1}$
- B. $\text{C}_n\text{H}_{2n+1}\text{COC}_n\text{H}_{2n+1}$
- C. $\text{C}_n\text{H}_{2n+1}\text{CHO}$

48. A primary amide is generally represented by the formula
- A. RCONHR
 B. RCONR_2
 C. RCOOR
 D. RCONH_2



The IUPAC nomenclature for the compound above is

- A. 2-methylpent-1-ene
 B. 2-methylpent-4-ene
 C. 4-methylpent-1-ene
 D. 3-methylpent-2-ene
50. An organic compound contains 60% carbon, 13.3% hydrogen and 26.7% oxygen. Calculate the empirical formula.
- A. $\text{C}_6\text{H}_{13}\text{O}_2$
 B. $\text{C}_4\text{H}_9\text{O}$
 C. $\text{C}_5\text{H}_{12}\text{O}$
 D. $\text{C}_3\text{H}_8\text{O}$
 [C = 12, H = 1, O = 16]

9. Option D.
 10. Option B.
 11. Option B.
 12. Option C.
 13. Option A.
 14. Option C.
 15. Option C.
 16. Option D.
 17. Option A.
 18. Option C.
 19. Option D.
 20. Option C.
 21. Option D.
 22. Option A.
 23. Option C.
 24. Option B.
 25. Option B.
 26. Option A.
 27. Option D.
 28. Option A.
 29. Option C.
 30. Option A.
 31. Option B.
 32. Option C.
 33. Option C.
 34. Option B.
 35. Option D.
 36. Option C.
 37. Option B.
 38. Option D.
 39. Option B.
 40. Option B.
 41. Option C.
 42. Option C.
 43. Option B.
 44. Option A.
 45. Option D.

2013 UTM E Chemistry

Solutions

1. Option D.
 2. Option D.
 3. Option D.
 4. Option C.
 5. Option D.
 6. Option A.
 7. Option A.
 8. Option A.

-
- 46. Option B.
 - 47. Option A.
 - 48. Option D.
 - 49. Option C.
 - 50. Option D.

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