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University of Nigeria, Nsukka * 2009/10 – (1) A
Department of Pure and Industrial Chemistry
2009 / 2010 Second Semester Examination,
CHM 127; Basic Principles of Organic Chemistry
TIME ALLOWED; 1 HOUR 30 MINUTES

Name ----------
Dept ----------
Reg. no ----------
Serial No ----------
Sign ----------

Q1. Which combination of physical methods would you employ for the separation of components of a mixture of sand and sodium nitrate? [A]
(A). Solvent extraction (with water) and crystallization
(B). Crystallization and steam distillation
(C). Chromatography and fractional crystallization (D) None of the above

Q2. In paper chromatographic experiment for a mixture containing two components only, the distance moved by solvent front is 17.0 cm while the distance moved by components A and B are 7.0 cm and 15.0 cm respectively, what is the R_f value for component B [C]
(A) 1.88 (B) 0.41 (C) 0.88 (D) none of the above

Q3. A pure sample of an organic compound on combustion analysis gave 361 mg of CO_2 and 147 mg of H_2O. If the weight of the sample is 202 mg, calculate the weight of carbon in the sample [B]
(A) 97.5 mg (B) 98.5 mg, (C) 99.5 mg (D) none of the above

Q4. In the analysis of an organic sample by the Dumas method, 2.22 cm^3 of nitrogen gas was evolved when 4.32 mg of the sample was used at 21^0 C and 743 mmHg. What volume of nitrogen obtained at STP is obtained from this experiment? [A]
(A) 2.02 cm^3 (B) 2.04 cm^3 (C) 4.20 cm^3 (D) none of the above

Q5. 0.667 g of an organic sample treated by the Kjeldahl's method gave sufficient ammonia to react with the hydroxonium ions in 22.2cm^3 of 0.5 M sulphuric acid. What is the weight of nitrogen in the sample? [C]
(A) 0.2108 g (B) 0.3008 g (C) 0.3108 g (D) none of the above

Q6. Which of the organic products is obtained when cyclobutene is treated with ozone and decomposed with zinc/ethanioc acid? [A]
(A) $OCHCH_2CH_2CHO$ (B) $HO_2CCH_2CH_2CO_2H$ (C) $HOCH_2CH_2CH_2CH_2OH$ (D) CH_3COCH_2CHO

Q7. The minor product obtained when 2-bromo-3-methylbutane reacts with alcoholic KOH is [A]
(A) $CH_3CH(CH_3)CH=CH_2$ (B) $CH_2=C(CH_3)CH_2CH_3$ (C) $CH_3C(=CH_2)CH_2CH_3$ (D) None of the above

Consider the sequence of reaction below and answer questions (8-10);

$$CH_3CH=CH_2 \xrightarrow{A} CH_3CHBrCH_2Br \xrightarrow{B} CH_3C\equiv CH \xrightarrow[H.Br]{excess} C$$

Q8. Which of the following reagents represents A? [B]
(A) Zn/HCl (B) Br_2/CCl_4 (C) 1% $KMnO_4$ (D) $Ag(NH_3)_2OH$

Q9. ; What is the reagent B? [C]
(A) H_2O (B) $Cu(NH_3)_2OH$ (C) $2NaNH_2/liq.NH_3$ (D) $HgSO_4/dil.H^+$

Q10. The organic product C is identified as [D]
(A) 1,1-Dibromopropane (B) 1,2-Dibromopropane (C) 2-Bromopropane (D) 2,2-Dibromopropane

Q11. The number of bonds an atom can form depends on the [C]
(A). Structure of the compound to be formed (B). Type of bond to be formed
(C). Electronic configuration of the element (D). Shape of the molecule to be formed

Q12. Which of the following compounds contains sp^2 hybridized carbon tom [A]
(A). Pent-2-ene (B). Butane (C) Ethanol (D). Propyne

Q13. Which of the following is out of place? [C]
(A). Pentane (B). 2-Methylbutane (C). Butane (D). 2,2-Dimethylpropane

(19)

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Q14. Consider the reaction below;

$CH_3CH{=}CH_2 + HBr \xrightarrow{\text{peroxide}} (A)$

If (A) is an organic compound, which of the following is (A)
(A). Alcohol (B). Grignard reagent C) Bromoalkane (D). Bromoalkene

Q15. Pyroligenous acid is a mixture of
(A). Ether, acid and acetone (B) Ether, methanol and acetone
(C). Acid, methanol and acetone (D) Acid, ethanol and acetone

Q16. The boiling point of isomeric alcohols change in the other;
(A) $3^o < 2^o < 1^o$ (B) $3^o > 2o > 1^o$ (C). $2^o > 1^o > 3^o$ (A) $1^o > 3^o > 2^o$

Q17. In the preparation of chloroalkanes from alcohols, one of the following catalysts is used;

(A). $SOCl_2$ (B). Zn dust (C) $ZnCl_2$ (D). $ZnSO_4$

Q18. The elimination reaction of halo-alkanes yields
(A) Alcohols, (B) Alkenes (C) Ketones (D) Alkynes

Q19. Reagents that attack a benzene ring mostly is one of the following
(A) Neutrophiles (B) Nucleophiles (C) Electrophiles (D) Carbocation

Q20. The number of pie-electrons in methylbenzene is;
(A) 3 (B) 6 (C) 10 (D) 20

Q21. , In the reaction below;

$+ \frac{9}{2}O_2 \longrightarrow$ the main product

(A) Phthalic anhydride (B) Buene-1,2-dicarboxylic acid
(C) Ethene-1,2-dicarboxylic anhydride (D) Butene-1,4-trioxode

Q22. When coal is carbonized, the main products are;
(A) Coke, silt, crude benzole and petrol (B) Coke, town gas, crude benzole and coal tar
(C) Coke, coal tar, petrol and crude benzole (D) Coke, crude benzole, town gas and naphth

Q23. On each sp^2-hybridised carbon, there are;
(A) Three hybrid atomic orbitals and unhybridized 2p atomic orbital
(B) Three unhybridised atomic orbitals and one hybridized 2p atomic orbital
(C) Two hybridized and two unhybridised orbitals (D) No unhybridised orbital

Q24. The bonds in propane are stronger than the bonds in propene because;
(A) Propane contains sp-orbital while propene contains sp^2-orbitals
(B) Propane contains sp-orbital while propene contains sp^3-orbital
(C) Propane contains sp^3-orbital while sp^2-orbital
(D) propane is a liquid while propene is a gas

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University of Nigeria, Nsukka **
Department of Pure and Industrial Chemistry
2009 / 2010 Second Semester Examination,
CHM 122; Basic Principles of Organic Chemistry
TIME ALLOWED; 1 HOUR 30 MINUTES

Names----------
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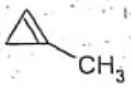
Q1. Which physical method would you employ in the separation of components of a mixture containing solid component contaminated with solid impurities? [C]
(A). Steam distillation (B). Chromatography (C). Recrystallization (D). Solvent extraction

Q2. In a thin layer chromatographic experiment for a mixture containing two components only, the distance moved by solvent front is 17.0 cm while the distance moved by components A and B are 7.0 cm and 15.0 cm respectively, what is the R_f value for component A [A]
(A) 0.41 (B) 0.45 (C) 0.88 (D) 0.80

Q3. A pure sample of an organic compound on combustion analysis gave 361 mg of CO_2 and 147 mg of H_2O. If the weight of the sample is 202 mg, calculate the weight of hydrogen in the sample [D]
(A) 0.0173 g (B) 0.0174 g, (C) 0.0183g (D) 0.0163

Q4. In the analysis of an organic sample by the Dumas method, 2.22 cm^3 of nitrogen gas was evolved when 4.32 mg of the sample was used at 21^0 C and 743 mmHg. What is the weight of nitrogen at STP? [D]
(A) 2.1525 mg (3) 2.3250 mg (C) 2.0525 mg (D) none of the above

Q5. 0.589 g of an organic sample treated by the Kjeldahl's method gave sufficient ammonia to react with the hydrogen ions in 44.4cm^3 of 0.5 M sulphuric acid. What is the weight of nitrogen in the sample? [A]
(A) 0.6216 g (B) 0.2036 g (C) 0.6016 g (D) 0.3136 g

Q6. An organic compound with molecular formula C_4H_6 reacts with 1 mole of bromine and gives butane-1,4-dial when treated with O_3 and Zn/AcOH. Which of the options represents the compound? [C]
A) $CH_3CH_2C\equiv CH$ B) $CH_3C\equiv CCH_3$ C)  D) 

Q7. Consider this equation
$(CH_3CH_2)_2CHMgX \xrightarrow{H\ Cl} X + Y$
The organic product X from the above equation is [A]
(A) $CH_3CH_2CH_2CH_2CH_3$ (B) $(CH_3CH_2)_2CHCl$ (C) $CH_3CH_2CH_3 + CH_3CH_3$ (D) NOTA

Q8. Which carbon atoms are sp^2 hybridized in the compound below? [C]
$CH_3\ CH{=}CHC{\equiv}CH$
5 4 3 2 1
(A). 1 and 2 (B). 2 and 3 (C). 3 and 4 (D). 1 and 5

Consider the reaction sequence and answer questions (8-10)

$CH_3C\equiv CH \xrightarrow{NaNH_2} (D) \xrightarrow{C_2H_5X} (E)$
$(D) \xrightarrow{(F)} CH_3COCH_3$

Q9. Choose from the options, the product D [A]
(A) $CH_3C\equiv C^-Na^+$ (B) $CH_3C\equiv C\text{-}NH_2$ (C) $CH_3CH{=}CH\text{-}NH_2$ (D) NOTA

Q10. ; Provide the reagent F [B]
(A) 1% $KMnO_4$ (B) Hg^{2+}/dil.H_2SO_4 (C) NaOH/H_2O_2 (D) $NaNH_2$/liq.NH_3

Q11. One of the options below represents the product E [D] (21)
(A) Pent-1-yne (B) Pent-2-ene (C) But-2-yne (D) Pent-2-yne

Q12. Consider the two compounds below;
$CH_3CH_2OCH_3$, $CH_3CH(OH)CH_3$ What are they? [A]
(A). Functional group isomers (B). Tautomers (C) Stereoisomer (D). Constitutional isomers

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2009/10 — (2) — E

Q13. Which of the following is responsible for addition reaction in alkenes? [A]
(A) pi-electrons (B) sigma electrons (C) sp^2-hybrid orbital (D) one s and one p-orbitals

Q14. How many sigma bonds are there in the compound below? [C]
$CH_3(CH)CH_3CH{=}{=}CHCH_3$
(A). 6 (B) 2 (C) 17 (D) 14

Q15. Which of the following compounds contains trigonal hybridized carbon [A]
(A). Heptene (B). Butane (C) Pentyne (D). Ethane

Q16. In the halogenations reaction of alcohols, the different halides require the following reagents [C]
(A). Cl-$ZnCl_2$, I-H_2SO_4, Br-H_3PO_4 (B) Cl-HNO_3, I-H_3PO_4, Br-H_2SO_4
(C) Cl-$ZnCl_2$, I-H_3PO_4, Br-H_2SO_4 (D) None of the above

Q17. One of the comments stated below is not correct about the tests for alcohols [A]
(A) A tertiary alcohol dehydrogenated to give an alkene when passed over heated copper
(B)A secondary alcohol reacts with Lucas rengent to give alkyl chloride within 5-10 mins
(C)A primary alcohol does not react appreciably with Lucas reagent at room temperature
(D) A secondary alcohol dehydrogenated to give a ketone when passed over copper

Q18. Ethers undergo the following reactions except with [C]
(A) Acids (B) Oxygen (C) Alkali (D) None of the above

Q19. The difference between alcohols and phenols is a result of; [D]
(A) The influence of the OH group on the aromatic ring (B) The influence of the substitiuents on the aromatic ring (C) The influence of the substitiuents on the OH group
(D) The influence of the OH group or the substitiuents

Q20. One of the methods of the preparation of phenols include [B]
(A) Fission of sulphonic acids with alcohols (B) Fusion of aromatic sulphonic acids with alkalis
(C) Fusion of aromatic acids with alkalis (D) None of the above

Q21. The exceptional stability of benzene ring is caused by the; [C]
(A) Presence of alternating single and double bonds in the ring (B)Planar nature of the benzene molecule
(C) Delocalization of the pi-electrons above and below the plane of the molecule
(D) Sp^2-hybridization of the carbon atoms in the benzene molecule

Q22. To nitrate benzene, the reagents required concentrated sulphuric acid and concentrated nitric acid. The nitrating agent is called; [D]
(A) Mixed ion (B) nitrate ion (C) nitrolium ion (D) nitronium ion

Q23. For the reaction below;
3 Molecules of but-2-yne $\xrightarrow{\text{heat}}$ product (X)
The product (X) of the reaction is; [D]
(A) 1,3,5-trimethylbenzene (B) 1,2,3-trimethylbenzene
(C) 1,2,3,6-tetramethylbenzene (D) 1,2,3,4,5,6-hexamethylbenzene

Q24. Which of the following compounds is out of place? [B]
(A) $CH_3(CH)CH_3CH_2CH_3$ (B) $CH_3(CH)CH_3CH_3$
(C) $CH_3C(CH_3)_2CH_3$ (D) $CH_3CH_2CH_2CH_2CH_3$

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niversity of Nigeria, Nsukka
Department of Pure and Industrial Chemistry
2009/2010 Second Mid-semester Test;
CHM122: Basic Principles of Organic Chemistry
Time Allowed; 20 minutes.

Names:_____
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Reg no:_____
Sign:_____

Q1. The reaction of propyne with $2HI/H_2O_2$ produces one of the following options as the product

(A) $CH_3Cl_2CH_3$
(B) $CH_3{\cdot}CHICH_2I$
(C) $CH_3CH_2CHI_2$
(D) $CH_3CH{-}{-}CHI$ [C]

Q2. In paper chromatographic experiment for a mixture containing two components only, the distance moved by solvet front is 17.0cm while tge distance A and B are 7.0cm and 15.0cm respectively What is the Rf value for component A. [D]

(A) 0.88 (B) 0.80 (C) 0.71 (D) 0.41

Q3. On each Sp^2 hybridized carbon, there are; [A]

(A) Three hybrid atomic orbitals and unhybridized 2p atomic orbital
(B) Three unbybridized atomic orbitals and one hybridized 2p atomic orbital
(C) Two hybridized and two unhybridized orbitals
(D) No unhybridized orbital.

Q4. The compound below can be concerted into a saturated compound by; [D]

$$CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-C\equiv C\,CH_2CH_3$$

(A) Substitution reaction
(B) Hybridization
(C) heterolytic cleavage
(D) addition reaction

Q5. Consider the reaction below; [A]

$CH_3CH_2Br + CH_3CH_2COOAg \rightarrow$ organic product

(A) $CH_3CH_2COOCH_2CH_3$
(B) CH_3CH_2COOBr
(C) CH_3CH_2Ag
(D) $CH_3CH_2COOBr + CH_3CH_2Ag$

Q6. Which of the following determines the structure of a compound? [A]

(A) The forces holding the atoms in the molecules
(B) The number of atoms in the molecule
(C) The type of atoms in the molecule
(D) All of the above.

Q7. Consider the reaction;

$$CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}CH_2Cl + CH_3CH_2ONa \rightarrow \text{Organic product}$$

Which of the following is the organic product ? [A]

(A) ether (B) alcohol (C) ester (D) ketone

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niversity of Nigeria, Nsukka
Department of Pure and Industrial Chemistry
2009/2010 Second Mid-semester Test;
CHM122: Basic Principles of Organic Chemistry
Time Allowed; 20 minutes.

Names:_____
Dept:_____
Reg no:_____
Sign:_____

Q1. The reaction of propyne with $2HI/H_2O_2$ produces one of the following options as the product.

(A) $CH_3Cl_2CH_3$
(B) CH_3CHICH_2I
(C) $CH_3CH_2CHI_2$
(D) $CH_3CH{=}CHI$ [C]

Q2. In paper chromatographic experiment for a mixture containing two components only, the distance moved by solvet front is 17.0cm while tge distance A and B are 7.0cm and 15.0cm respectively What is the Rf value for component A. [D]

(A) 0.88 (B) 0.80 (C) 0.71 (D) 0.41

Q3. On each Sp^2 hybridized carbon, there are; [A]

(A) Three hybrid atomic orbitals and unhybridized 2p atomic orbital
(B) Three unbybridized atomic orbitals and one hybridized 2p atomic orbital
(C) Two hybridized and two unhybridized orbitals
(D) No unhybridized orbital.

Q4. The compound below can be concerted into a saturated compound by; [D]

$$CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-C\equiv C\,CH_2CH_3$$

(A) Substitution reaction
(B) Hybridization
(C) heterolytic cleavage
(D) addition reaction

Q5. Consider the reaction below;

$CH_3CH_2Br + CH_3CH_2COOAg \rightarrow$ organic product [A]

(A) $CH_3CH_2COOCH_2CH_3$
(B) CH_3CH_2COOBr
(C) CH_3CH_2Ag
(D) $CH_3CH_2COOBr + CH_3CH_2Ag$

Q6. Which of the following determines the structure of a compound?

(A) The forces holding the atoms in the molecules [A]
(B) The number of atoms in the molecule
(C) The type of atoms in the molecule
(D) All of the above.

Q7. Consider the reaction;

$$CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}CH_2Cl + CH_3CH_2ONa \rightarrow \text{Organic product}$$

Which of the following is the organic product ? [A]

(A) ether (B) alcohol (C) ester (D) ketone

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University of Nigeria, Nsukka ****
Department of Pure and Industrial Chemistry
2009 / 2010 Second Semester Examination,
CHM 122; Basic Principles of Organic Chemistry
TIME ALLOWED, 1 HOUR 30 MINUTES

Names Ameh
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3 mins

Q1. Which physical method would you for the purification of a liquid organic compound capable of decomposing at its boiling point under atmospheric pressure. [D]
(A). Simple distillation (B). Steam distillation
(C). Fractional distillation (D). Distillation under reduced pressure

Q2. In paper chromatographic experiment for a mixture containing three components only, the distance travelled by components A, B and C are 9.0 cm and 10.0 cm and 14.0 cm respectively. If the distance travelled by solvent front is 14.0 cm, what is the R_f value of component B [B]
(A) 7.0442 (B) 7.143 (C) 0.8143 (D) None of the above

Q3. The combustion of 0.124 g of a pure organic sample yielded 0.248 g of $CO_{2(g)}$ and 0.101 g of $H_2O_{(g)}$. What is the weight of hydrogen in the sample? [B]
(A) 0.011 mg (B) 0.011 g (C) 0.022 mg, (D) 0.022 g

Q4. An organic sample of weight 3.684 mg gave 6.850 mg of silver chloride on gravimetric analysis. What is the % content of chlorine in the sample? (Ag = 108, Cl = 35.5) [A]
(A) 46.01 % (B) 46.00 % (C) 46.04 % (D) 47.01 %

Q5. In the analysis of an organic sample by the Dumas method, 4.44 cm^3 of nitrogen gas was evolved when 4.32 mg of the sample was used at 21° C and 743 mmHg. What is the weight of nitrogen in the sample? [B]
(A) 5.0488 mg (B) 5.0388 mg (C) 5.0088 mg (D) none of the above

Q6. The reaction of propyne with $2H_2O/H_2O_2$ produces one of the following options as the product: [A]
(A) $CH_3CH_2CH_3$ (B) $CH_3CH_2CH_2$ (C) CH_3CHCH_2 (D) $CH_3CH{=}CH$

Q7. Hydroxylation of carbon-carbon triple bonds with $2H_2O/KMnO_4$ produces one of the following: [D]
(A) Tetraol (B) Diol (C) Tetral (D). Diene

Consider the reaction sequence and answer questions (8-10);

$$CH_3CH_2CH{=}CH_2 \xrightarrow{Cl_2/CCl_4} U \xrightarrow[C_2H_5OH]{2\ KOH} V \xrightarrow{W} CH_3CH_2COCH_3$$

Q8. The organic product U is which of the following: [D]
(A) $CH_3CH_2CH_2CHCl_2$ (B) $CH_3CH_2CCl_2CH_3$ (C) $CH_3CH_2CH_2CH_2Cl$ (D) $CH_3CH_2CHClCH_2Cl$

Q9. Identify the product V from the following options: [A]
(A) But-1-yne (B) But-2-yne (C) Butane (D) But-2-ene

Q10. Which of the reagents represents W? [C]
(A) Zn/HCl (B) 1% aq. $KMnO_4$ (C) $H_2O/Hg^{2+}/H_2SO_4$ (D) Br_2/CCl_4

Q11. Consider the compound,

$CH_3CH_2CH{=}CH_2$
4 3 2 1

Which of the carbons are in sp^2 hybridized state? [D]
(A) 1 and 4 (B) 2 and 3 (C) 3 and 4 (D) 1 and 2

Q12. Which of the following compounds will not exhibit geometrical isomerism? [C]
(A) But-2-ene (B) Hex-2-ene (C) Propene (D) 3,4-Dimethylhex-3-ene

Q13. Which of the following compounds is out of place? [B]
(A) $CH_3(CH)CH_3CH_2CH_3$ (B) $CH_3(CH)CH_3CH_3$
(C) $CH_3C(CH_3)_2CH_3$ (D) $CH_3CH_2CH_2CH_2CH_3$

..... sigma bonds are there in 2-Methylpropane? [B]

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2009/2010 - (2) D

Q15. Consider the reaction below:

$CH_3CH_2CH_2Cl + Mg \xrightarrow{\text{dry ether}} (A)$

The organic product (A) is
(A) An ether (B) An alkene (C) A Grignard reagent (D) A nitrile

Q16. Among the isomeric alcohols, as the branching decreases, solubility in water also does the following

(A) Increases (B) Decreases (C) Remain static (D) None of the above

Q17. Controlled oxidation of methane yields methanol in one of these ranges of temperature and pressure

(A) 350°C and 150 bars (B) 400°C and 150 bars (C) 450° and 250 bars (D) 350°C and 300 bars

Q18. The reaction between benzene and chlorine to form chlorobenzene proceeds in the presence of

(A) $FeCl_3$ and steam (B) $FeCl_3$ and ice (C) $FeCl_3$ (D) $FeCl_3$ and heat

Q19. Sand Mayer reaction can result to the formation of
(A) Bromobenzene (B) Chlorobenzene (C) Iodobenzene (D) All of the above

Q20. Identify the product of reaction below

$R\text{-}CH_2\text{-}CH{=}{=}CH_2 \xrightarrow{H\text{-}Br} (?)$

(A) R-CHBr-CH_3 (B) R-CHBr-CH_2 + H_2 (C) R-CBr_2CH_3 + H_2 (D) R-CHBr-CH_3 + H_2

Q21. Benzene can be prepared at high temperature by the polymerization of:

(A) 3 Molecules of ethane (B) 3 Molecules of ethene (C) 3 Molecules of propene
(D) 3 Molecules of ethyne

Q22. The carbon atoms in benzene of a benzene ring are
(A) S^3P Hybridized (B) S^2P Hybridized (C) SP^2 Hybridized (D) SP^3 Hybridized

Q23. In the reaction below
The organic product of the reaction below is

$CH_3\text{-}I + Benzene \xrightarrow{AlI_3}$ organic product

(A) Iodobenzene (B) Ethylbenzene (C) Methylbenzene (D) 1-Iodobenzene

Q24. Which of the following statement is not true of the benzene molecule?
(A) All the carbon to carbon bond distances are equal
(B) The ring is planar with the shape of a regular hexagon
(C) The molecule is highly unsaturated
(D) The molecule is completely symmetrical

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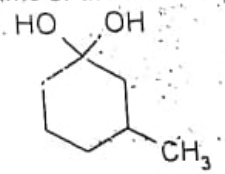
2011 Second Mid-Semester Test, Reg. no. .....
4122, Basic Principles of Organic Chemistry. Sign .....
TIME ALLOWED; 20 MINUTES

Q1. A pure sample of an organic compound on combustion analysis gave 361 mg of CO_2 and 147 mg of H_2O. If the weight of the sample is 202 mg. calculate the weight of hydrogen in the sample? [A]
(A) 0.0163 g (B) 0.0173 g (C) 0.0183 (D) none of the above

Q2. Which of the methods would you use to obtain active ingredients (drugs) from natural medicinal plants? [A]
(A) Chromatography (B) Simple distillation
(C) Solvent extraction (D) Distillation under reduced pressure

Q3. The reaction between an alkene and halogen acids proceed by [B]
(A) Addition reaction (B) Nucleophilic substitution reaction
(C) Atom displacement reaction (D) Elimination reaction

Q4. Give the name of the structure below; [A]



(A) 3-Methylcyclohexane- 1, 1-diol (B) 1-Methylcyclohexane-3, 3-diol
(C) 3-Methylcyclohaxanediol (D) 3-Methylbenzene-1, 1-diol

Q5. The IUPAC name of the organic product (U) below is [D]

$$CH_2CH_2CH{=}CH_2 \xrightarrow{Cl_2/CCl_4} U \xrightarrow[C_2H_5OH]{2\ KOH} V \rightarrow C$$

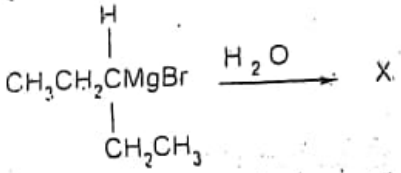
(A). 1,1-dichlorobutane (B) 2,2-dichlorobutane
(C) 1,3-dichlorobutane (D) 1,2-dichlorobutane

Q6. Identify the product V from the following options; [B]
(A) But-1-yne (B) But-2-yne (C) Butane (D) But-2-ene

Q7. The isomerism exhibited by CH_3CH_2CHO and CH_3COCH_3 is known as [C]
(A) Position somerism (B) Nuclear isomerism
(C) Constitutional isomerism (C) Functional group isomerism

Q8. Which of these is obtained in geometrical isomerism? [C]
(A) Staggered and eclipsed (B) Tautomerism
(C) Cis-Trans (D) Constitutional

Q9. Consider the reaction below



If X is the organic product in the above reaction, what is X? [A]
(A) Pentane (B) Pentanol
(C) Pentanone (D) 1-Ethylpropane

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Department of Pure and Industrial Chemistry
2010 / 2011 Second Mid-Semester Test, Reg. no. ----------
CHM 122; Basic Principles of Organic Chemistry Sign ----------
TIME ALLOWED; 20 MINUTES

Q1. Consider this equation;

$$2\,CH_3CH_2Br + 2\,Na \xrightarrow{ether} Alkane + 2\,NaBr$$

[1C]

The alkane formed in the above reaction is;
(A) Propane (B) Pentane (C) Butane (D) Ethane

Q2. To name an alkane which the structure is given, one of the following statements is not acceptable; [1C]
(A) First identify the longest carbon chain
(B) The position and name of the substitiuents must be indicated
(C) Number the chain from the end which will give the highest number(s) to the position(s) of the substitiuents
(D) A hyphen is placed between the position number and the name of the substitiuents.

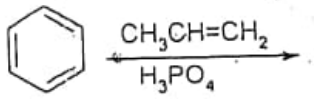
Q3. In the analysis of an organic sample by the Dumas method, 4.44 cm^3 of nitrogen gas evolved when 4.32 mg of sample was used at 21 °C and 743 mmHg. What is the weight of nitrogen in the sample? [1D]
(A) 6.0388 mg (B) 4.0388 mg (C) 5.0088 mg (D) 5.0388 mg

Q4. The two main natural sources of aromatic compounds are; [1B]
(A) Crude oil and petroleum (B) Coal and crude oil
(C) Coal and lime stone (D) Coal tar and petroleum

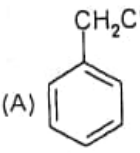
Q5. All the entities in each list are suitable electrophiles for aromatic substitution [1A]
(A) SO_3, CH_3-C=O$^+$, Cl^+, NO_2 (B) SO_3, Cl_2, CH_3COCl, Br^-
(C) SO_3, Cl^- CH_3^- Br_2 (D) None of the above

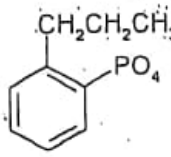
Q6. When coal is carbonized, the main products are; [1B]
(A) Coke, silt, crude benzole and petrol
(B) Coke, town gas, crude benzole and coal tar
(C) Coke, coal tar, petrol and crude benzole
(D) Coke, crude benzole, town gas and naphthalene

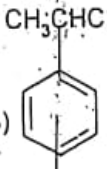
Q7. For the reaction below

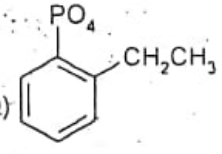


The major product is; [1]

(A) 

(C) 

(B) 

(D) 

Q8. The carbon-carbon bond in ethene is shorter than the carbon-carbon bond in ethane because of; [1B]
(A) Incomplete hybridization (B) Presence of pi-bond
(C) Lack of sigma bond in ethane (D) Restricted rotation in ethane

Q9. Consider the reaction below;

$$CH_3CH_2CH_2Br + NaOH \xrightarrow{reflux} organic\ product$$

[1B]

The organic product of the is;
(A) an ester (B) an alcohol (C) an ether (D) an aldehyde

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UNIVERSITY OF NIGERIA, NSUKKA. Dept. of Pure & Ind. Chem.
2011/2012 CHM 122 Second Semester Examination +
Answer All Questions, Time: 1 hr S/N...67.

Name:
Reg No:
Dept:

Instruction: Tick √ against the letter bearing the correct answer; No cancellation or use of Pencil.

1. Which compound exhibits both cis-trans and optical isomerism?
[A] $CH_3CH=CHCH_2CH_3$ [B] $CH_3CHBrCH=CH_2$ [C] $CH_3CBr=CBrCH_3$ [D] $CH_3CH_2CHBrCH=CHBr$

2. The specific rotation of an optically active compound at 20°C and wavelength of 5893A° (D line of sodium) is 5.756°. What is the angle of rotation if a 10cm polarimeter tube is used at a concentration of 0.05moldm^{-3}. Molar mass of the compound is given as 84. [A] -0.0484 [B] -0.0242 [C] 23.352 [D] 0.0242.

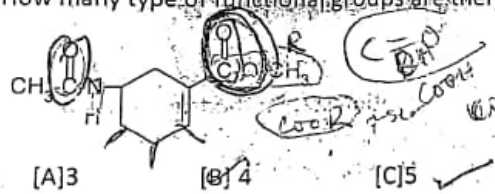
3. Which of the following is not a characteristic of a Pi bond [A] formed by lateral overlap of p orbitals [B] does not have free rotation [C] one or two bonds can exist between two atom [D] less stable than sigma bond.

4. The hybridization state, geometry and bond angle for carbon and oxygen atoms in methanal, H_2CO are ----, ------ & ------ respectively [A] sp^3, trigonal & 120° [B] sp^2, linear & 180° [C] sp, tetrahedral & 109.5° [D] sp^2, trigonal & 120°.

5. What type of isomerism is shown by the following compounds

[A] functional group [B] geometrical [C] chain [D] position

6. How many type of functional groups are there in the following molecule



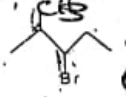
[A] 3 [B] 4 [C] 5 [D] 2

7. Isomers that have the same physical properties except for the direction of rotation of plane of polarized light are called [A] enantiomers [B] diasteriomers [C] cis-tran isomers [D] configurational isomers

8. Which of the following reagent(s)/condition(s) cannot convert propanone to propanol [A] CH_3MgBr/H_3O^+ [B] $H_2/Ni/200°C$ [C] Na/Ethanol [D] $LiAlH_4$/diethyl ether

9. Which of the following is the commonest type of bonding in organic chemistry? [A] covalent [B] ionic [C] metallic [D] co-ordinate covalent

10. The IUPAC name of the compound having the following structure



[A] 2-methyl-3-bromopentane [B] 4,4-dimethyl-3-bromopentane [C] 1,1-dimethyl-2-bromobutane [D] 4-methyl-3-bromopentane

Use the following isomers of butanol to answer question 11 to 14.

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Butan-1-ol I | Butan-2-ol II | 2-Methylpropan-2-ol III | 2-Methylpropan-1-ol IV

11. Which of the alcohols is/are primary? [A] I&II [B] I&III [C] II&IV [D] II&IV

12. Which alcohol(s) contain(s) a chiral center ? [A] IV [B] III [C] II [D] I&II

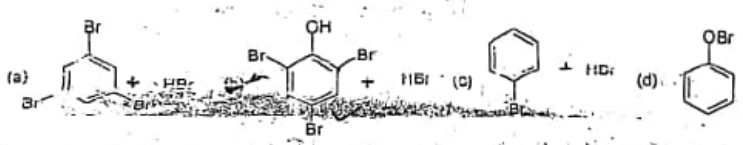
13. Which of the alcohol(s) may be dehydrated to form 2-methylpropene [A] II [B] III [C] IV [D] I

14. Which alcohol(s) react(s) with acidified sodium dichromate (VI) to form a ketone containing the same number of carbon atom as the alcohol(s)? [a] I&II [b] III [c] II [d] IV &II.

15. Which term describes the action of NaOH(aq) on bromoalkane? [A] acid-base reaction [B] elimination of HBr [C] nucleophilic substitution [D] electrophilic substitution.

16. Which formula represents the organic compound formed by reaction of propanoic acid with methanol in the presence of concentrated sulphuric acid as catalyst? [A] $CH_3CH_2COCH_3$ [B] $CH_3CH_2CO_2CH_3$ [C] $CH_3CO_2CH_2CH_3$ [D] $CH_3CH_2CH_2CO_2CH_3$.

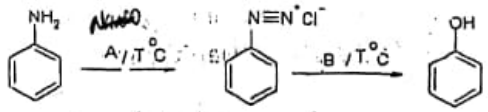
17. The product(s) of the reaction of phenol with excess aqueous bromine is/are



18. What is the correct order of reactivity of the alkyl halides towards SN^2 reaction mechanism. [A] 3ry>2ry>1ry> CH_3X [B] CH_3X>1ry> 2ry >3ry [C] 2ry >3ry>1ry> CH_3X [D] NOTA

19. Which equation represents a valid propagation step in the free radical reaction between ethane and chlorine? [A] $C_2H_6 + Cl\bullet \rightarrow C_2H_5Cl + H\bullet$ [B] $C_2H_5Cl + Cl\bullet \rightarrow C_2H_4Cl\bullet + HCl$ [C] $C_2H_6 + H\bullet \rightarrow C_2H_5\bullet + HCl$ [D] $C_2H_5\bullet + Cl\bullet \rightarrow C_2H_5Cl$

20. Phenol may be synthesized in the laboratory by the following reaction sequence.



Reagents A and B and their respective appropriate temperatures are as follows [A] NaCl+H_2O/>5 and NaOH/boil [B] $NaNO_3$+ HCl/<5 and H_2O/> 10 [C] NaOH+H_2O/boil and HCl/25 [D] NH_3+H_2O/<10 and H_2SO_4/2

(10)

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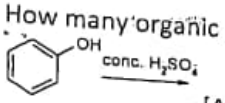
21. The major product of hydrobromination of But-1-ene in the presence of peroxide is
(A) 2-bromobutane (B)2-bromobut-1-ene (C) 1-bromobut-2-ene (D) 1-bromobutane

22. 105 mg of an organic compound on determination for nitrogen by the Kjeldahl's method produced ammonia gas which neutralized completely 23.5 cm3 of 0.05M HCl. What is the percentage of nitrogen in the compound? [A] 16.71% [B] 15.00% [C] 17.71% [D] 15.71%

23. 3.665×10^{-3} g of an organic sample gave 6.850×10^{-3} g of silver chloride. What is the percentage of chlorine in the compound? (Cl =35.5; Ag =108) [A] 46.03% [B] 15.00% [C] 46.13% [D] 46.23%

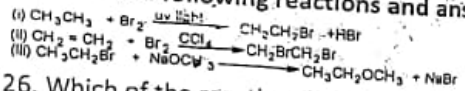
24. How many organic product(s) do you expect from the reaction below?



[A] One [B] NONE [C] Three [D] Two

25. 0155g of organic sample treated by the Carius method gave 0.2369g of silver bromide. Find the weight of bromine in the sample. [A] 0.0107 [B] 0.0546g [C] 0.01008g [D] 0.1008g

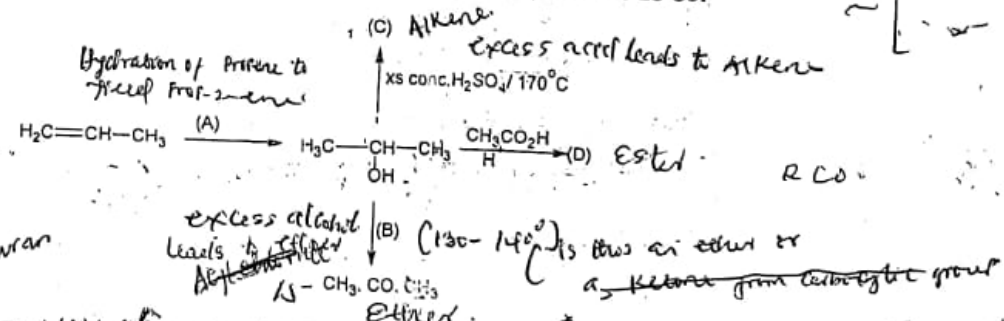
Consider the following reactions and answer questions 26 &27.



26. Which of the reactions represents nucleophilic substitution reaction?
[A] (iii) [B] (i) [C] (ii) [D] NOTA

27. Which of the reactions is a substitution by free radical mechanism?
[A] (i) [B] (ii) [C] (iii) [D] NOTA

Consider the following reaction scheme and answer questions 28-30.



28. Reagent (A) is [A] $Hg(OAc)_2$/ THF-H_2O/ $NaBH_4$/OH^- [B] H_2O/BH_3 [C] $BH_3/THF/H_2O_2$, OH^- [D] NOTA

29. Reagent (B) is: [A] $H^+/K_2Cr_2O_7$ [B] H^+/H_2O [C] Br_2 [D] NOTA

30. Product (C) is: [A] an alkene [B] an alcohol [C] an aldehyde [D] NOTA

31. Product (D) is: [A] an acid chloride [B] an amide [C] an ester [D] NOTA

Note: The action of Conc. H_2SO_4 on Alcohol is as follows:
⇒ under ordinary condition, ethylhydrogen tetraoxosulphate VI is produced
$C_2H_5OH + H_2SO_4 \rightarrow C_2H_5HSO_4 + H_2O$
⇒ At elevated temp (130–140°) excess Alcohol, ether is formed

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$CH_3CH = CH_2 \xrightarrow[(ii)\ H_2O_2/CH^-]{(i)\ BH_3,\ THF} ?$

32. The product of the above reaction is; [A] secondary alcohol [B] aldehyde [C] primary alcohol [D] NOTA

$CH_3CH = CH_2 \xrightarrow{HI/peroxide} (X)$

33. (X) in the above equation is : [A] CH3CHICH3 [B] CH3CH2CH2I [C] no reaction [D] NOTA

$H_3C{-}CH_2C{\equiv}CH \xrightarrow{2\ HOCl} ?$

34. The product of the above reaction is:

[A] $CH_3CH_2C(OH)_2C(Cl)_2H$ [B] $CH_3CH_2C(Cl)_2C(OH)_2H$ [C] $CH_3CH_2COCHCl_2$ [D] NOTA

35. $CH_3CH_2CH_2I + CH_3CH_2I + 2Na \longrightarrow ?$

Which of the following products is not possible from the above reaction? [A] $CH_3CH_2CH_2CH_2CH_2CH_3$ [B] $CH_3CH_2CH_2CH_3$ [C] $CH_3CH_2CH_2CH_2CH_2CH_2CH_3$ [D] $CH_3CH_2CH_2CH_2CH_3$

$CH_3CH_2CH_2CH_2MgBr \xrightarrow{H_2O}$

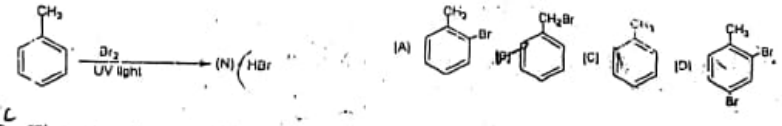
36. The organic product of the above reaction is: [A] Butan-1-ol [B] Butane [C] Butanoic acid [D] NOTA

37. An unsaturated hydrocarbon Y (C_5H_8) reacts with two molar equivalents of hydrogen to form the alkane C_5H_{12}, but does not react with ammoniacal silver nitrate. When subjected to ozonolysis under the usual laboratory practice, one molecule of Y forms one molecule of 2-oxopropanal and two molecules of methanal. The hydrocarbon Y is: [A] an alkyne [B] a diene [C] a triene [D] NOTA

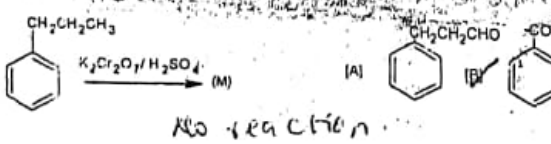
38 The structure of Y in question 38 is:

[A] $H_3C{-}C{\equiv}C{-}CH_2CH_3$ [B] $H_2C{=}\underset{CH_3}{C}{-}CH{=}CH_2$ [C] $H_3C{-}CH_2{-}CH_2{-}C{\equiv}CH$ [D] NOTA

39. Compound N in the reaction below is:



40. The structure of compound M in the reaction below is:



No reaction

reason; Benzylic Oxidation of a tertiary Alkyl benzene will yield no product but Benzylic oxidation of primary & Alkyl will yield Benzoic acid.

(12)

2nd Semester Exam

day	course	date	time
	Chm 122	03/09/14	12 -
	Chm 112	05/09/14	12 - 3
	~~Hams~~	~~Phy 114~~	
Thur	Phy 114	04/09/14	9am - 12
Friday	Phy 112	12/09/14	9am - 1

Ass 6

Multi-track Diplo

(1) what is multi-diplomacy.

(2) Briefly name & explain the 9 fr

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UNIVERSITY OF NIGERIA, NSUKKA. Dept. of Pure & Ind. Chem.
2012/2013 CHM 122 Second Semester Examination +++ +
Answer All Questions, Time: 1 hr S/N.....

Reg No.....
Dept.....

Instruction: Tick √ against the letter bearing the correct answer; No cancellation or use of Pencil.

1. During fractional distillation, the fractionating column in the apparatus enables ---
A The components of the mixture to develop into a chromatogram
B The components of the mixture to distil off
C The various components of the mixture to be clearly separated D None of the above

2. The rate of flow or retention factor (Rf) of an organic compound is -------
A Time dependent B Time independent
C Used in the quantitative separation of the organic compound D None of the above

3. Which of the following is not a nucleophile?
A H_2O B RNH_2 C Br D None of the above

4. Which of the following is a product of heterolytic cleavage of a covalent bond?
A RO B NO_2 C R D None of the above

5. 0.927g of an organic compound when heated strongly in a stream of dry oxygen produced 0.043g of carbon (iv) oxide. Calculate the percentage of carbon in the organic compound.
A 43.43% B 35.92% C 44.49% D None of the above

6. A pure organic compound of weight 0.0365g on analysis yielded 1.86cm^3 of nitrogen at a temperature of 30°C and pressure of 700mmHg. What is the percentage of nitrogen in the compound?
A 8.52% B 5.21% C 9.05% D None of the above

7. Calculate the percentage composition of carbon in the compound whose molecular formula is $C_2H_4O_2$. [C = 12; H=1; O=16].
A 40% B 50% C 35.5% D None of the above

8. An organic compound of molecular mass 92g.mol^{-1} contains the elements C, H, and O with percentage compositions of 52%, 13%, and 35% respectively. Deduce the molecular formula of the compound
A C_3H_8O B $C_4H_{11}O$ C $C_3H_{11}O_2$ D None of the above

9. The carbon atoms in ethyne are ---- hybridized
A SP^1 B SP^2 C SP^3 D None of the above

10. In which of the following compounds is rotation of carbon atoms relative to each other possible?
A Benzene B Ethyne C Ethane D None of the above

11. The nitrogen atom in RCHNH is ------ hybridized
A SP^1 B SP^2 C SP^3 D None of the above

12. In which of the following compound is the contribution of the S-orbital to hybridization highest?
A Ethyne B Ethene C Ethane D None of the above

13. An organic compound of weight 0.884g produced 1.305g of silver bromide on gravimetric analysis. What is the percentage content of bromine in the compound?

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[Ag = 108; Br = 80]
A 86.20% B 62. 80% C 49.05% D None of the above

14. The compound C_6H_5Cl undergoes a Lassaigne's test. The filtrate from
A NaI B Na_2S C NaCN D None of the above

15. A suitable solvent for chromatographic work is one with
A Low polarity B High polarity C Moderate polarity D None of the above

16. The principle behind any chromatographic process is the distribution of substances between the ---
A Solid phase and stationary phase B Solvent and mobile phases
C Stationary phase and mobile phase D None of the above

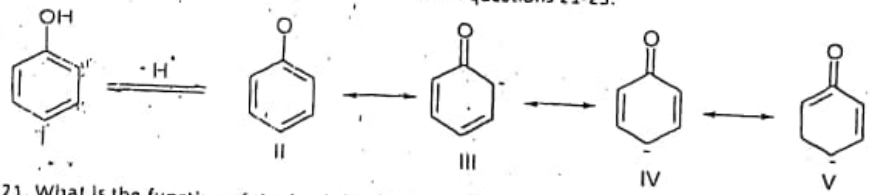
17. Organic compounds are numerous because ----------
A Organic compounds exhibit the phenomenon of isomerism
B Organic reactions are generally slow C Organic reactions are generally fast
D None of the above

18. The stationary phase in paper chromatography is --------
A Alumina B Water molecules trapped in the pores of the paper
C Silica gel D None of the above

19. The sp^3 hybrid orbitals of oxygen contain four equivalent orbitals where
A Two of the orbitals have pairs of electrons each and the remaining two have an unpaired electron each.
B Each of the orbital has an unpaired electron
C Three of the orbitals each contains an unpaired electron and one of the orbital has a lone pair of electron
D None of the above

20. What is the percentage composition of oxygen in the compound whose molecular formula is $C_4H_{12}O_2$? [C = 12; H = 1; O = 16]
A 43. 78% B 50.0% C 67.2% D None of the above

Consider the following structures and answer the questions 21-23:



21. What is the function of the (OH) that is attached to the benzene ring in structure I?
A It supplies electrons to the ring B It removes electrons from the ring
C It has no effect on the ring D None of the above

22. Which of the following structures II, III, IV and V is out of plane?
A II B III C V D IV

23. At which positions does the (O') activate the benzene ring towards electrophilic attacks?
A ortho and para B meta and para C meta and ortho D None of the above

Examine the reactions below and answer the questions 24-26:

(6)

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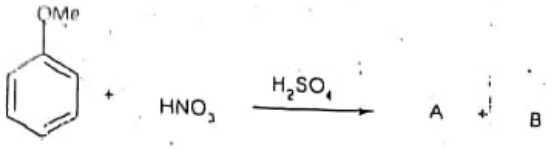


24. The products A and B are identified as
A 4-Nitromethoxybenzene and 2-Nitromethoxybenzene
B 2-Nitromethoxybenzene and 3-Nitromethoxybenzene
C 4-Ntromethoxybenzene and 3-Nitromethoxybenzene D None of the above

25. Identify the type of reaction that took place;
A Addition reaction B Nucleophilic substitution reaction
C Electrophilic substitution reaction D None of the above

26. What is the name of the reaction?
A. Sulphonation B Nitration C Methylation D None of the above

27 The IUPAC name of the compound $CH_2(OH)CH(OH)CH_2OH$ is
A Trihydroxypropane B Propane-1,2,3-triol C Prop-1,2,3-triol
D None of the above

Consider and identify X and the correct organic product of the reaction below; (answer 28-29)

$CH_3CH{=}CH_2 + \text{conc. } H_2SO_4 \rightleftharpoons X \xrightarrow{H_2O} \text{Organic product}$

28. Which of the following options represents X?
A. $CH_3CH_2CH_2SO_4H$ B $CH_3\underset{\underset{SO_4H}{|}}{C}HCH_3$ C $CH_3\underset{\underset{OSO_3H}{|}}{C}HCH_3$ D $CH_2CH_2CH_2OSO_3H$

29. The organic product of the reaction above is identified as;
A $CH_3\underset{\underset{OH}{|}}{C}HCH_3$ B $CH_3\underset{\underset{OH_2}{|}}{C}HCH_3$ C $CH_3CH_2CH_2OH$ D $CH_3CH_2CH_2OH_2$

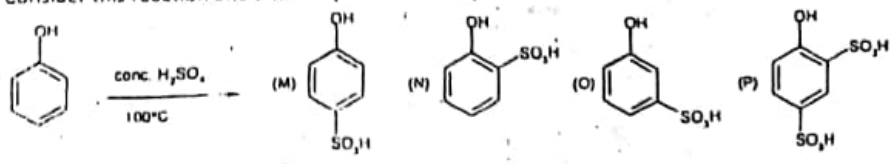
Examine the reaction below and provide answers to questions 30-31;

$CH_3CH_2CH_2CHO \longrightarrow CH_3CH_2CH_2CH_2OH$

30. Which of the following reagents is out of place concerning the reaction above?
A H_2/Ni / 200°C B Na/C_2H_5OH C $LiAlH_4/HCl$ D $ZnCl_2/HCl$

31. What is the function of the reagents that can achieve the conversion reaction above?
A. They are oxidizing agents B They are reducing agents
C They are hydrolyzing agents D None of the above

Consider this reaction and answer questions 32-33;



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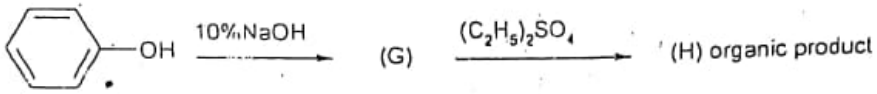
2012/13 – (4) – A

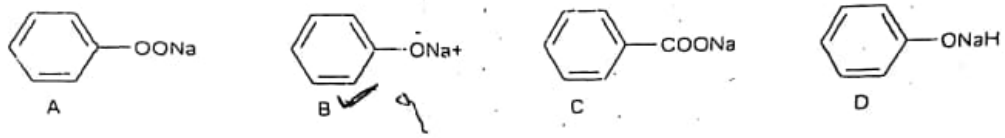
32. Which of the following structures is the main product of the reaction above?
A (N) B (M) C (O) D (P)

33. What is the IUPAC name of the product?
A 4-Hydroxybenzene-1-sulphonic acid B 2-Hydroxybenzene-1-sulphonic acid
C 3-Hydroxybenzene-1-sulphonic acid D 4-Hyroxybenzene-1,3-disulphonic acid

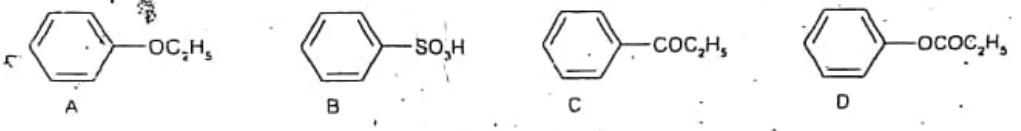
Complete the reaction sequence; (answer 34-35)



34. Identify (G) from the structures below



35. One of these options is identified as the organic product (H);



36. Which of the following reagents will react with the three types of alcohols :(tertiary, secondary and primary)?
A $ZnCl_2$/conc.HCl B Zn/conc. HCl C Alkaline $K_2Cr_2O_7$ D None of the above

37. Which of the following reagent can not be used to distinguish between terminal and non-terminal alkynes?
A 1% aq. $KMnO_4$ B $Ag(NH_3)_2OH$ C $Cu(NH_3)_2OH$ D None of the above

Consider the equation of reaction below and answer questions 18 and 19

38. The intermediate of the reaction is one of the following options
A $CH_3CH{=}C(OH)CH_3$ B $CH_3C(OH){=}C(OH)CH_3$ C $CH_3CH_2COCH_3$ D None of the above

39. The product is identified as
A $CH_3CH_2COCH_3$ B $CH_3C(OH){=}C(OH)CH_3$ C $CH_3CH{=}C(OH)CH_3$ D None of the above

40. Identify the IUPAC name of the compound $CH_3C(CH_3)_2CH_2CH(CH_3)CH_3$
A 2,2,4-Trimethylpentane B 4,4,2-Trimethylpentane
C 2,2,4-Dimethylpentane D None of the above

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UNIVERSITY OF NIGERIA, NSUKKA. Dept. of Pure & Ind. Chem. Name:.....
2013 2014 CHM 122 Second Semester Examination ++ Reg No.....
Answer All Questions, Time: 1 hr S/N..... Dept.....

Instruction: Tick √ against the letter bearing the correct answer; No cancellation or use of Pencil.

1 The importance of sodium fusion in the determination of nitrogen, sulphur and halogens in organic sample is to
A) remove any inorganic substance present in the sample
B) convert the elements into a form they can be detected by inorganic qualitative analysis ✓
C) remove other elements that may interfere with the analysis
D) none of the above

2. Which of the following is a necessary requirement for a mixture to be separated by crystallization?
A) one of the components of the mixture must sublime
B) the components of the mixture must have different boiling points
C) the components of the mixture must have different solubility in a given solvent ✓
D) the components of the mixture must have different melting points

3. A sodium fusion solution of an organic sample was treated with nitric acid and silver nitrate and a yellow precipitate was formed. If the yellow precipitate is soluble in dilute aqueous ammonia it indicates that
A) iodine is presenting the sample B) bromine is present in the sample
C) chlorine is present in the sample D) none of the above

4 One of the following is not required in the detection of sulphur in an organic compound.
A) copper (ii) oxide B) sodium plumbite C) lead acetate D) none of the above

5. Which of the following elements can be detected by zirconium alizarin's paper?
A) chloride B) phosphorus C) fluorine D) none of the above

6. Which of the following elements can be determined by Carius method?
A) sulphur B) chlorine C) iodine D) all of the above

7. 12.96mg of an organic sample was analysed by Dumas method at 27°C and 743mmHg and 6.66cm3 of nitrogen was evolved. Calculate the weight of the nitrogen in the sample.
A) 4.39mg B) 6.55mg C) 7.56mg D) none of the above

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

$V_2 = \frac{P_1V_1T_2}{T_1P_2} = \frac{743 \times 6.66 \times 23}{297 \times 760}$

8. The angle between two sp^2 hybrid orbitals is
A) 120° ✓ B) 180° C) 90° D) none of the above

9. Which of the following has the shortest carbon – carbon bond length?
A) ethene B) ethane C) ethyne ✓ D) none of the above

10. Propane is able to undergo addition reaction because of
A) covalent bond B) sigma bond C) pie bond ✓ D) all of the above

11. Alkynes do not show geometrical isomerism because they
A) do not contain pie bonds B) are linear compounds ✓
B) do not contain sigma bonds D) none of the above

12. Consider the equation below:

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$CH_3CH{=}CH_2 + Cl_2 \longrightarrow CH_3\underset{Cl}{C}H\text{-}\underset{Cl}{C}H_2$

What type of fission occurred in the reaction?

A) heterolytic fission B) homolytic fission

C) heterolytic and hemolytic fission D) none of the above

13 Consider the equation: $XY \longrightarrow X^+ + Y^-$

If X is a carbon, X^+ is known as a

A) carbon ion B) carbonium ion C) radical D) none of the above

14. The angle of rotation of plane polarized light depends on the

A) temperature of the sample solution B) wavelength of the light used

C) length of the sample tube D) all of the above

15. Which of the following reactions is not a nucleophilic substitution reaction?

A) $CH_3CH_2Br \xrightarrow{KOH/EtOH} CH_2{=}CH_2 + H_2O + KBr$

B) $CH_3Cl + KOH \xrightarrow{reflux} CH_3OH + KCl$

C) $CH_3CH_2Cl + NaCN \longrightarrow CH_3CH_2CN + NaCl$

D) none of the above

16. What is the likely products of the reaction below?

$CH_4 + Br_2(excess) \xrightarrow{UV}$ Products

A) $CH_3Br + HBr$ B) $CH_2Br_2 + HBr$

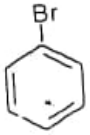
C) $CH_3Br + CH_2Br_2 + CHBr_3 + CBr_4 + HBr$ D) none of the above

17 The organic product of the reaction below is

$CH_3OH + SOCl_2 \longrightarrow$ Products

A) aldehyde B) alkane C) ether D) none of the above

18. Consider the equation below and name the organic product.



$+ Mg \xrightarrow{dry\ ether}$ Organic product

A) benzene B) Grignard reagent C) magnesium benzene D) none of the above

19. Supply the reagent(s) and/or solvent required for the following conversion

$2CH_3CH_2Cl \longrightarrow CH_3CH_2CH_2CH_3 + 2NaCl$

A) 2Na/dil. HCl B) 2Na/dry ether C) 2NaOH/dry ether D) none of the above

20. The organic product of the reaction below is

$CH_3CH_2CH_2Cl \xrightarrow{+ NH_3}$?

A) cyanide B) amine C) alkene D) none of the above

21. One of these is not a type of isomerism found in alkanes:

A) Constitutional isomerism B) Chain isomerism

C) Stereoisomerism D) Nuclear isomerism

22. Give the correct name for the compound below

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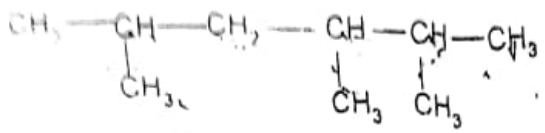


A) 2,4,5 – Trimethyl hexane B) 2,3,5 – Trimethyl pentane
C) 2,3,5 - Trimethyl hexane D) 2,4,5 – Trimethyl heptanes

23 One of these is a method for the preparation of alkanes
A) Sandmeyer reaction B) Dow process
C) Williamson synthesis D) Wurtz reaction

24. Supply the conditions for the reaction below

C_2H_6 —(i) / (ii)→ $C_2H_4 + H_2$

A) 120 – 300°C. $LiAlH_4/H_2SO_4$ B) 400 – 700°C, Al_2O_3/SiO_2
C) 400 – 550°C, Al_2O_3/SiO_2 D) 400 – 700°C, Pd/H_2

25 The test for un-saturation in alkenes involves the following
A) Halogenation with CCl_4 B) Halohydrin formation
C) Hydration of alkenes D) All of the above

26 One of these is NOT a method for the preparation of alkenes
A) Halogenation B) Hydrogenation of alkynes
C) Dehydrohalogenation D) Dehydration of alcohol

27 One of these effectively describes an alkyne
A). Alkynes are sp^2 hybridized having 3π bonds with bond angle of 120°
B) Alkynes are *sp* hybridized having 1σ and 2 π bonds with bond angle of 180°
C) Alkynes are sp^3 hybridized having 1σ and 2 π bonds with bond angle of 120°
D) Alkynes are *sp* hybridized having 2σ and 1π bond with bond angle of 180°

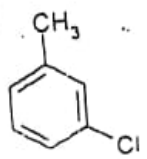
28 Ethyne is contaminated with one of these combinations to give it the characteristic adour.
A) Poisoned catalyst B) H_2S and $HgCl_2$
C) H_2S and quinine D) H_2S and Phosphine

29. Supply the conditions for the following reaction

i) H - C≡C – H —$H_2/Pd\text{-}CaCO_3$/quinoline→ C_2H_4 ii)

A) H_2, Ni/Pt, Pd B) H_2/Pd, $BaSO_4$/quinoline
C) H_2/Pd, $CaCO_3$/quinoline D) None of the above

30. Give the nomenclature of the compound below



A) 1 - Methyl – 3- chlorobenzene B) 2 – Chloro – 4 – methylbenzene
C) 1 - Chloro – 3 methylbenzene D) None of the above

31 One of these is responsible for the stability of benzene

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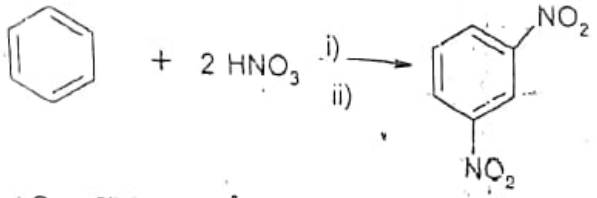
A) The possession of a σ and π- bond B) The un-saturation in the benzene molecule
C) The dynamic equilibrium between the two structures of benzene
D) The delocalization of the π-electrons in the benzene

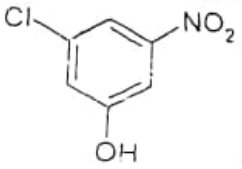
32 Supply the conditions for the reaction stated below



A) Conc.H_2SO_4, 150°C, $2H_2O$ B) Conc. H_2SO_4,50°C, H_2O
C) Conc. H_2SO_4, 250°C, H_2O D) Conc. H_2SO_4, 200°C, $2H_2O$

33. Benzenes undergo the following reactions except;
A) Alkylation B) Hydrogenation C) Nitration D) Sulphonation

34. Give the nomenclature of the compound stated below



A) 2 – Chloro – 6 – nitrophenol B) 2 – Nitro – 6 – chlorophenol
C) 3 – Chloro – 5 - nitrophenol D) None of the above

35. One of the following is a secondary alcohol
A) $CH_3CH(OH)CH_3$ B) $(CH_3)_3COH$ C) CH_3CH_2OH D) $(CH_3)_2C(OH)CH_2CH_3$

36. In the tests to distinguish the three classes of alcohols, one of the following is correct,
A) A primary alcohol is dehydrated to give an aldehyde
B) A primary alcohol is dehydrogenated to give a ketone
C) A tertiary alcohol is dehydrogenated to give a ketone
D) A secondary alcohol is dehydrogenated to give a ketone

37. The general reactivity of hydrogen halides with alcohols proceed in the order;
A) HI < HBR < HCl B) HCl > HBR > HI
C) HCl < HBR < HI D) None of the above

38. One of these properties describes a phenol adequately;
A) It is readily soluble in cold water B) It is slightly denser than water
C) It is fairly soluble in ethanol B) It is less acidic than alcohols

39. One of these is not a reaction of phenol;
A) Nitration B) Halogenation C) Sulphonation D) Carboxylation

40. When warmed with water or dilute acid, epoxyethane does one of the following,
A) Is hydrated to ethylene glycol B) Is dehydrated to ethane
C) Is hydrated to tetrahydrofuran D) Is dehydrated to ethyne

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2013/14 (1) — A

...VERSITY OF NIGERIA, NSUKKA
...PARTMENT OF PURE & INDUSTRIAL CHEM.
...01 2014 SECOND SEMESTER EXAMINATION
CHM 122 – BASIC PRINC. OF ORGANIC CHEM.
ANSWER ALL QUESTIONS
TIME ALLOWED: 40 MINUTES
INSTRUCTION: Write your answer in the space provided below each question. Mutilation or writing in pencil is not allowed.

DEPT.....
REG. NO.:.....
S/NO.:.....
SIGN.:.....

OKA FOR CHS

1. The calculated relative overlapping power of sp atomic orbital is? [ ]
(A) 1.00 (B) 1.72 (C) 1.93 (D) 2.00

2. If the overlap of the two atomic orbitals has taken place along their major axis (head-head), the resulting bonding molecular orbital is called? [ ]
(A) pi-orbital (B) Sigma-orbital (C) Pi-sigma orbital (D) Pi-pi orbital

3. Two mirror images that are not super-imposable on each other are called? [ ]
(A) Asymmetric images (B) Dextrorotatory (C) Enantiomers (D) Diastereoisomers

4. The part of organic molecule responsible for its chemical reactivity is called? [ ]
(A) Isomerism (B) Tautomerism (C) Functional group (D) Homologues series

5. In sp^2 hybridized state, the carbon atom combines with three other atoms by using; [ ]
(A) 2s¹, 2px¹, 2py¹, 2pz¹ (B) 2s¹, 2px¹, 2py¹, (C) 2s¹, 2px¹, 2pz¹ (D) 2s¹, 2py¹, 2pz¹

6. Which of the following is a partition chromatography [ ]
(A) Paper chromatography (B) Column chromatography (C) Thin-layer chromatography (D) AOTA

7. Carius method is used in the determination of the amount of the following elements in organic compounds, except ..... [ ]
(A) Sulphur (B) Chlorine (C) Iodine (D) none of the above

8. Compound Y is a liquid with boiling point 6... °C but decomposes on heating at temperature of about 60 °C, which of the following methods is the best for purifying compound Y? [ ]
(A) Sublimation (B) fractional distillation (C) steam distillation (D) none of the above

9. In the analysis of an organic compound by the Dumas method, 2.25cm³ of nitrogen was evolved when 4.35mg of sample was used at 22 °C and 746mm Hg. What is the weight of nitrogen obtained from the sample? (Relative atomic mass, N=14, volume of 1 mole of a gas at STP=22400cm³) [ ]
(A) 0.0042g (B) 0.0026g (C) 0.0255g (D) NOTA

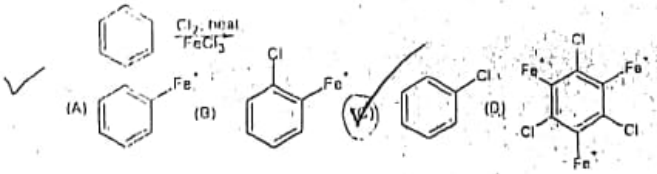
10. Calculate the percentage of nitrogen in the sample in question 9 above. [ ]
(A) 59.77% (B) 61.0% (C) 60.07% (D) NOTA

11. Supply the product(s) of the following reactions [ ]

$CH_3CH_2CH_2CH{=}CH_2 \xrightarrow{HBr} ?$

(A) $CH_3CHBrCH_2CH_2CH_3$ (B) $CH_3CH_2CH_2CHBrCH_3$
(C) $CH_3CH_2CH_2CH_2Br$ (D) $CH_3CH_2CHBrCH_2CH_3$

12. Complete the following reactions



13. Arrange the following alkyl halides in increasing order of their boiling points

CH_3CH_2F, CH_3CH_2I, CH_3CH_2Cl and CH_3CH_2Br

(A) $CH_3CH_2Cl > CH_3CH_2I > CH_3CH_2F > CH_3CH_2Br$
(B) $CH_3CH_2I > CH_3CH_2Br > CH_3CH_2Cl > CH_3CH_2F$
(C) $CH_3CH_2Br > CH_3CH_2Cl > CH_3CH_2F > CH_3CH_2I$
(D) $CH_3CH_2F > CH_3CH_2Cl > CH_3CH_2Br > CH_3CH_2I$

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[ ]

30. Name the reactant labelled X in the following reaction

$X + HCl + H_2O + CH_3CH_2MgCl \xrightarrow[\text{Ether}]{} CH_3C(CH_3)OHCH_2CH_3 + MgCl_2$

(A) Propanone (C) ethanol

(B) Butanal (D) NOTA

31. $CH_3CH_2CH_2CH{=}O + CH_3CH_2CH_2NH_2 \longrightarrow$

(A) $CH_3CH_2CH_2CHOHNHCH_2CH_2CH_3$ (B) $CH_3CH_2CH_2C{=}NC_3H_7$

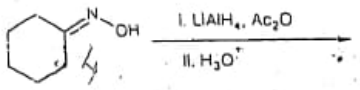
(C) $CH_3CH_2CH{=}CHNHC_3H_7$ (D) AOTA [ ]

32. Which of the following is the odd one

(A) Leuckart reaction (C) Meerwein arylation

(B) Schmidt rearrangement (D) Hofmann's rearrangement [ ]

33. The reaction below gives



(A) Cyclohexanamine (B) cyclohexanoic acid (C) benzenamine (D)cyclohexanamide [ ]

34. The reaction of benzene diazonium chloride with benzene in the presence of sodium hydroxide to give biphenyl is called

(A) Schiemann reaction (C) Gattermann reaction

(B) Sandmeyer reaction (D) Gomberg-Bachmann reaction [ ]

35. Arrange the following in order of increasing basicity in aqueous phase

(I) N-propyl-1-butanamine (II) N,N-dipropyl-1-butanamine (III) 1-butanamine

(A) II<III<I (B) III<II<I (C) I<II<III (D) I>III>II [ ]

36. The boiling point of isomeric alcohols change in the order stated below;

(A) 1° > 3° > 2° (B) 2° > 1° > 3° (C) 3° < 2° < 1° (D) 3° > 2° > 1° [ ]

37. One of the methods of the preparation of phenols include the following;
(A) Fusion of aromatic acids with alkalis (B) Fusion of aromatic sulphonic acids with alkali (C) Fission of sulphonic acids with alcohols (D) None of the above [ ]

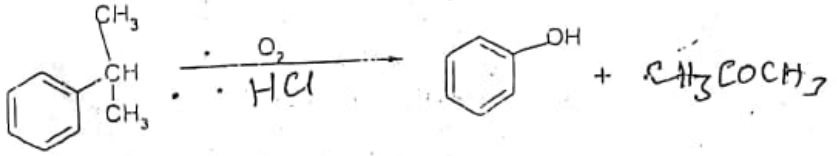
38. One of these statements is true of the dehydration of alcohols;

(A) 2° alcohols > 1° alcohols > 3° alcohols (B) 1° alcohols > 2° alcohols > 3° alcohols
(C) 3° alcohols > 2° alcohols > 1° alcohols (D) None of the above [ ]

39. Ethers show basic characters because of the presence of one of these;

(A) The positive charge on the oxygen atom (B) The sulphuric acid in the reaction (C) The OH group in the compound (D) The lone pair of electrons on the oxygen [ ]

40. Give the complete reaction conditions and product of the following equation



(A) HCl and $(CH_3)_2C{=}O$ (B) HCl and CH_3CH_2COOH (C) H_2SO_4 and $(CH_3)_2C{=}O$
(D) HNO_3 and CH_3CH_2OH [ ]

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$CH_3CH_2Br + CH_3COOAg \longrightarrow$

(A) CH_3COOCH_3 (B) $CH_3COCH_2CH_3$

(C) CH_3CH_2COBr (D) $CH_3COOCH_2CH_3$

15. A substitution nucleophilic reaction in which the leaving group detaches itself completely from the substrate before the incoming group takes its position is [ ]

(A) substitution nucleophilic unimolecular (C) substitution nucleophilic halomolecular

(B) substitution nucleophilic bimolecular (D) substitution nucleophilic heteromolecular.

16. The empirical formula of a hydrocarbon containing 0.12 mole of carbon and 0.36 mole of hydrogen is [ ]

(A) CH (B) CH_3 (C) C_2H_3 (D) CH_4

17. Which of the types of hybridisation gives rise to tetrahedral molecules? [ ]

(A) sp (B) sp^2 (C) spd (D) none of the above

18. How many isomers can be obtained from C_4H_{10}? [ ]

(A) 0 (B) 2 (C) 3 (D) 1.

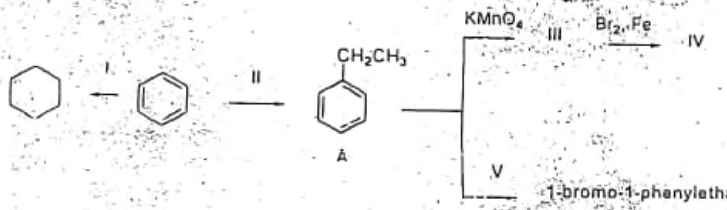
19. Cycloalkanes have the same general molecular formula as [ ]

(A) alkanes (B) monoalkenes (C) alkynes (D) dialkenes

20. Ethyne is used in welding because [ ]

(A) it is highly exothermic (B) it is highly endothermic (C) it is unsaturated (D) it is explosive gas

Use the reaction sequence below to answer the following questions:



21. I is/are (A) Ni/150 °C (B) HNO_3/H_2SO_4 (C) uv light/heat (D) NOTA [ ]

22. II is/are (A) $Br_2/FeBr_3$ (B) H_2SO_4/CH_3CH_3 (C) $CH_3CH_2Cl/AlCl_3$ (D) CH_3CH_2Br, uv light. [ ]

23. III is (A) toluene (B) aniline (C) benzoic acid (D) xylene [ ]

24. IV is (A) 3-bromobenzoic acid (B) 3-bromoaniline (C) 4-bromotoluene (D) 3-bromostyrene [ ]

25. V is/are (A) Ni/150 °C (B) $Br_2/FeBr_3$ (C) Br_2/uv light/heat (D) NOTA [ ]

26. In the following reaction below what is the reactant labeled X? [ ]

$X \xrightarrow{\text{Heat}} (HCO2)\,2\,Ca \longrightarrow 2CH3CH2CHO + 2CaCO3$

(A) $(CH_3CH_2COO)2Ca$ (B) $(CH_3COO)_2Ca$

(C) $(CH_3CH(CH_3)CO_2)_2Ca$ (D) None of the above

27. In the Rosenmund reaction of the acid chloride below, what is the product marked Y? [ ]

$C_6H_5COCl + H_2 \xrightarrow{Pd/BaSO_4} Y + HCl$

(A) CH_3CHO (C) CH_3CH_2CHO

(B) $C_6H_5COCH_3$ (D) NOTA

28. Name the butanone which is an isomer of $CH_3CH(CH_3)CH_2COCH_3$ [ ]

(A) 2-pentanone (C) 4-methylbutan-3-one

(B) 2-melthylbutan-3-one (D) NOTA

29. Represent the product of this reaction? [ ]

$C_6H_5CHCl_2 \xrightarrow{H_2O/NaOH}$

(A) $C_6H_5COCH_3$ (C) $C_6H_5COCH_3$

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26. How many grammes of CO_2 can be prepared by burning 20 g of propyne? [ ]
(A) 66 (B) 132 (C) 44 (D) 22

27. Alkenes can be differentiated from alkanes by the reaction with [ ]
(A) $KMnO_4$ (B) O_2 (C) NaOH (D) HCl

28. Geometric isomerism can be shown by all except [ ]
(A) C_3H_6 (B) C_4H_8 (C) $C_2H_2Br_2$ (D) C_6H_{12}

29. Reaction with silver salt serves to distinguish [ ]
(A) propyne from propene (B) ethene from ethane (C) benzene from hexane [d] none of the above

30. Halogenation of alkanes proceeds via which mechanism? [ ]
(A) substitution (B) free radical (C) elimination (D) ionic

31. What is the systematic name of the organic compound $CH_3C(CH_3)_2CH_2CH_2COOH$ [ ]
(A) 4 -methlpentanoic acid (B) 4 - methylhexanoic acid (C) Hexanoic acid (D) None of the above

32. Under what condition would the following conversion take place? [ ]

$$CH_3CHOHCH_2CHO \longrightarrow CH_3CH{=}CHCHO + H_2O$$

(A) Heat (B) NaOH (C) Zn-Hg/HCl,H_2O (D) None of the above

33. What is the product labelled Y in the following reaction? [ ]

$$CH_3CHO + 3Cl_2 \xrightarrow{H^+} Y + 3HCl$$

(A) CH_2ClCHO (B) $CHCl_2CHO$ (C) CCl_3CHO (D) None of the above

34. An organic compound G reacts with $LiAlH_4$ in dry ether solution to give butan-2-ol as below. What is G? [ ]

$$G \xrightarrow[\text{Dry ether solution}]{LiAlH_4} CH_3CH_2CHOHCH_3$$

(A) Propanone (B) Butanal (C) Pentanone (D) None of the above

35. A carbonyl compound reacts with X as represented below. Name X [ ]

$$CH_3COCH_3 + X \xrightarrow{H_3O^+} (CH_3)_2C{=}N{-}CH_2CH_3 + H_2O$$

(A) Ethylamine (B) Propylamine (C) Methylamine (D) None of the above

36. Acid anhydride contains which of the functional groups? [ ]
(A) -COX (B) –CHO (C) COOCO (D) –COOR

37. Which of the following is out of place? [ ]
(A) H_3O^+ (B) NO_2^+ (C) HO^- (D) R^+

38. What are other groups that are the same in question 37? [ ]
(A) Nucleophiles (B) Electrophiles (C) Radicals (D) Carbocation

39. How many none bonded electrons are there in RNH_2 and H_2O? [ ]
(A) Two and Four (B) Two and Two (C) One and Three (D) Three and Four.

40. Which of the following is not among the structural isomerism? [ ]
(A) Optical isomerism (B) Chain isomerism (C) Position isomerism (D) Functional isomerism

(15)

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UNIVERSITY OF NIGERIA, NSUKKA ****
DEPARTMENT OF PURE & INDUSTRIAL CHEM.
2013/2014 SECOND SEMESTER EXAMINATION
CHM 122 – BASIC PRINC. OF ORGANIC CHEM.
ANSWER ALL QUESTIONS
TIME ALLOWED: 40 MINUTES

DEPT .....
REG, NO. .....
S/NO .....
SIGN : .....

INSTRUCTION: Write your answer in the space provided below each question. Mutilation or writing in pencil is not allowed.

1. Which of the following oxidizing agents cannot oxidize tertiary amines?

(A) H_2SO_4 (B) O_3 (C) H_2O_2 (D) $KMnO_4$ [1]

Use the reactions below to answer questions 2 and 3

$$R_2NH + CS_2 \longrightarrow A \xrightarrow{HgI} AB$$

2. A in the equation above is a .....
(A) Thiocarbamic acid (B) dithiocarbamic acid (C) alkyl isothiocyanate (D) NOTA [2]

3. AB in the equation above is a .....
(A) Quaternary ammonium salt (B) No reaction (C) alkyl isothiocyanate
(D) Quaternary ammonium hydroxide [2]

4. Arrange the following in order of decreasing basicity in gaseous phase
(I) N,N-dimethyl methanamine (II) N-methyl methanamine (III) N,N-diethyl methanamine
(A) I>II>III (B) II<I<III (C) III>II>I (D) III>I>II [1]

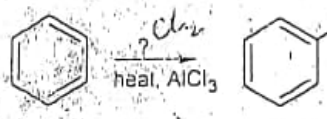
5. The formation of enamines from secondary amines requires .....
(A) Water (B) aldehydes with α-hydrogen (C) aldehydes without α-hydrogen
(D) Aldehydes with β-hydrogen [2]

6. Supply the product(s) of the following reactions

$$CH_3CH_2CH{=}CH_2 \xrightarrow[H_2O_2]{HBr}$$

(A) $CH_3CH_2CH_2CH_2Br$ (B) $CH_3CH_2CHBrCH_3$
(C) $CH_3CHBrCH_2CH_3$ (D) $CH_3CH_2CH_2BrCH_3$ [1]

7: Complete the following reactions



(A) NaCl (B) H_2O_2 (C) HCl (D) Cl_2 [1]

8. Arrange the following alkyl halides in decreasing order of their boiling points
CH_3F, CH_3I, CH_3Cl and CH_3Br
(A) $CH_3Br < CH_3F < CH_3I < CH_3Cl$ (B) $CH_3I < CH_3F < CH_3Cl < CH_3Br$
(C) $CH_3Br < CH_3Cl < CH_3F < CH_3I$ (D) $CH_3F < CH_3Cl < CH_3Br < CH_3I$ [1]

9. Supply the products of the following reactions

$$CH_3CH_2Br + CH_3CH_2CH_2ONa \longrightarrow$$

(A) $CH_3CH_2OCH_2CH_3$ (B) $CH_3CH_2CH_2CH_2OCH_3$
(C) $CH_3CH_2CH_2ONaCH_2CH_3$ (D) $CH_3CH_2CH_2CH_2OCH_2CH_3$

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10. The elimination reaction in which there is simultaneous loss of the leaving groups is
(A) elimination unimolecular (B) elimination bimolecular (C) elimination unquemolecular
(D) none of the above. [B]

11. Which of the following reagents is required in the detection of carbon in organic compound?
(A) Sodium metal (B) Copper metal (C) Calcium hydroxide (D) None of the above [C]

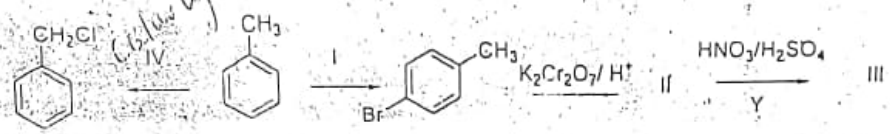
12. One of the following is a carrier gas in Gas-Liquid chromatography
(A) Oxygen (B) Chlorine (C) Nitrogen oxide (D) None of the above [D]

13. In thin layer chromatography, the coated plate is dried in an oven in order to .....
(A) increase the surface area (B) activate it (C) make it brighter (D) all of the above [B]

14. 0.1344g of an organic compound was analysed by Carius method. After filtration and drying, 0.1204g of $BaSO_4$ was obtained. Calculate the percentage of sulphur in the organic compound. (relative atomic masses: Ba=137, S=32, O=16) (A) 16.54% (B) 12.35% (C) 2.31% (D) NOTA [C]

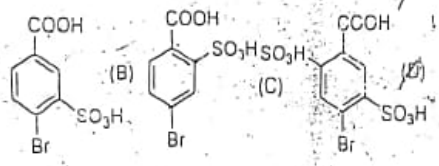
15. What is the emperical formula of an organic compound with percentage composition of 40.0% carbon, 6.7% hydrogen and 53.3% oxygen? (A) CH_2O (B) C_2H_3O (C) $C_2H_3O_2$ (D) NOTA [A]

Use the sequence of reactions given below to answer the following questions:



16. Reagent I is (A) HNO_3 (B) CH_3Cl/H_2SO_4 (C) $CH_3Br/FeBr_3$ (D) CH_3Br/HCl [C]

17. Product II is (A) 4-bromoaniline (B) 4-bromonitrobenzene (C) 4-bromobenzoic acid (D) NOTA [C]

18. Product III is (A)  (B) (C) (D) NOTA

[A]

19. Reagent(s) IV is/are (A) Cl_2/ uv light (B) $Cl_2/FeBr_3$ (C) $Cl_2/K_2Cr_2O_7$ (D) NOTA [A]

20. The electrophile in step Y is (A) HSO_4^- (B) H_3O^+ (C) NO_2^+ (D) NOTA [C]

21. When warmed with water or with dilute acid, epoxyethane does the following;
(A) Dehydrates to ethylene glycol (B) Hydrates to ethylene glycol
(C) Hydrates to Tetrahyrofuran D) None of the above [B]

22. One of the comments stated below is NOT correct about the test for alcohols;
(A) A secondary alcohol is dehydrogenated to give a ketone when passed over heated copper
(B) A primary alcohol does not react appreciably at room temperature with Lucas reagent
(C) A secondary alcohol reacts with Lucas reagent to give the alkyl chloride within 5-10min
(D) A tertiary alcohol is dehydrogenated to give an alkene when passed over heated copper [D]

23. The reactivity of hydrogen halides with alcohols follows the order;
(A) HBr < HI < HCl (B) HI < HBr < HCl (C) HCl < HBr < HI (D) HCl > HBr > HI [C]

24. Complete the reaction equation stated below;

A) CH_3MgBr; H_2O B) Na or K/EtOH, 200°C C) H_2SO_4, H_2O D) None of the above [A]

25. One of these statements is NOT true about the esterification reactions of alcohols;
(A) Alcohols react with acid anhydrides to give esters
(B) Tertiary alcohols react with acyl chlorides to give esters
(C) Primary and secondary alcohols react with carboxylic acids to give esters
(D) None of the above [B]

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