Organic Chemistry

(1) Organic Compounds

-2006 IV(1)-(3)

For compounds with the molecular formula $C_4H_{10}O$, answer the following questions.

(1) How many structural isomers are there?

(2) How many of them are alcohols?

(3) How many of them are esters?

-2007 IV(1)

(1) Select the functional group from [B] of each of the compounds ①–⑧ in [A], and select the name of the compound from [C].

[A]	[B]	[C]
① CH_3OH	(a) ketone	(a) acetaldehyde
② CH_3CHO	(b) carboxyl	(b) methyl acetate
③ CH_3OCH_3	(c) nitro	(c) nitromethane
④ CH_3NO_2	(d) amino	(d) toluene
⑤ CH_3Br	(e) ester	(e) methylamine
⑥ CH_3COOH	(f) ether	(f) methanol
⑦ CH_3NH_2	(g) aldehyde	(g) dimethyl ether
⑧ CH_3COCH_3	(h) propyl	(h) acetic acid
	(i) sulfonyl	(i) ethanol
	(j) phenyl	(j) bromomethane
	(k) hydroxyl	(k) acetone
	(l) halogen	(l) xylene

-2009 VI

Ⅵ Which compound has geometrical isomers (*cis-trans* isomer)? Choose one from 1) to 6).

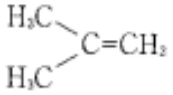
1) $CH_2=CH-COOCH_3$

2) $CH_3-CH(OH)-COOCH_3$

3) $H_3COOC-(CH_2)_3-COOCH_3$

4) $CH_2=C(COOCH_3)_2$

5) $H_3COOC-CH=CH-COOCH_3$

6) 

-2009 VII

Ⅶ How many structural isomers does dichloropropane $C_3H_6Cl_2$ have?

-2010 Q16

Q16 From ①-⑥ below choose the most appropriate combination of general names of the following functional groups (**a**)-(**c**). **16**

(**a**) $-SO_3H$ (**b**) $-OH$ (**c**) 

	a	b	c
①	carboxy group	nitro group	aldehyde group
②	carboxy group	nitro group	carbonyl group
③	carboxy group	hydroxy group	aldehyde group
④	sulfo group	nitro group	carbonyl group
⑤	sulfo group	hydroxy group	aldehyde group
⑥	sulfo group	hydroxy group	carbonyl group

-2014 VI(4)

X is an alcohol with the molecular formula $C_5H_{12}O$.

(4) How many structural isomers of X have a chiral carbon center?

-2015 V(1)-(4)

V Write the correct answer in the appropriate box on the Answer Sheet below.

(1) How many structural isomers exist for C_5H_{12}?

(2) How many structural isomers have an asymmetric carbon for C_5H_{12}?

(3) How many classes of alcohol exist for $C_4H_{10}O$?

(4) How many classes of ether exist for $C_4H_{10}O$?

-2016 V(2)-(3),(6)

(2) How many isomers exist for mono-substituted naphthalenes?

(3) How many isomers exist for naphthalene derivatives with the same two substituents?

(6) Anthracene is a solid polycyclic aromatic hydrocarbon of formula $C_{14}H_{10}$, consisting of three fused benzene rings. How many isomers exist for mono-substituted anthracenes?

-2016 VI(3)

(3) Which of the descriptions 1) to 4) is correct for the combustion of ethylene?

1) It burns with a bright flame and with a characteristic smell.
2) Soot accumulates when it burns.
3) It is accompanied by the generation of toxic gas when it burns.
4) It does not burn.

-2017 V(5)

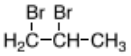
B is $C_6H_{12}O_2$

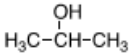
(5) How many structural isomers exist for the ester **B**?

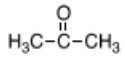
-2018 VI(7)

(7) How many structural isomers are possible for the compound with a molecular formula of $C_4H_{10}O$?

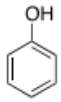
-2019 V(2)

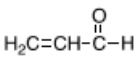
A: 4) 

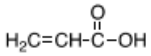
B: 10) 

C: 12) 

D: 18) 

E: 20) 

F: 9) 

G: 11) 

(2) Select the appropriate compound that is obtained as an equimolar mixture of enantiomers from **A** to **G**.

(2) Properties of Functional Groups

-2006 IV(4)-(5)

For compounds with the molecular formula $C_4H_{10}O$, answer the following questions.

(4) How many alcohols among them are active with the iodoform reaction?

(5) How many alcohols among them can be oxidised with $K_2Cr_2O_7$?

-2006 V

Choose a suitable reagent to distinguish between the following sets of functional groups. Do not use a symbol twice.

(1) Alcohol and ester

(2) Aldehyde and ketone

(3) Carboxylic acid and ether

a. Glucose	b. Sodium carbonate	c. Acetylene
d. Sodium	e. Ethylene	f. Sulfuric acid
g. Fehling's reagent	h. Methane	i. Ethanol

-2007 IV(2)-(3)

〔A〕	〔B〕	〔C〕
① CH_3OH	(a) ketone	(a) acetaldehyde
② CH_3CHO	(b) carboxyl	(b) methyl acetate
③ CH_3OCH_3	(c) nitro	(c) nitromethane
④ CH_3NO_2	(d) amino	(d) toluene
⑤ CH_3Br	(e) ester	(e) methylamine
⑥ CH_3COOH	(f) ether	(f) methanol
⑦ CH_3NH_2	(g) aldehyde	(g) dimethyl ether
⑧ CH_3COCH_3	(h) propyl	(h) acetic acid
	(i) sulfonyl	(i) ethanol
	(j) phenyl	(j) bromomethane
	(k) hydroxyl	(k) acetone
	(l) halogen	(l) xylene

(2) What is the product when ① and ⑥ in 〔A〕 are heated with a small amount of sulfuric acid? Select the product from 〔C〕.

(3) What is the product when ② in 〔A〕 is heated with ammoniacal silver nitrate solution? Select the product from 〔C〕.

-2008 IV(2)-(4)

(1) CH_3CH_2Cl (2) CH_3CH_3 (3) CH_3CH_2CN

(4) $BrHC=CHBr$ (5) $\left[CH_2-CH_2 \right]_n$ (6) CH_3CHO

(7) CH_3COOH (8) CH_3CH_2Br (9) $BrCH_2CH_2Br$

(10) $H_2C=CHC(=O)OCH_3$ (11) $H_2C=CHOH$ (12) $H_2C=CH_2$

(13) $H_2C=CHCN$ (14) CH_3OH (15) $H_3C-C(=O)-CH_3$

(16) $CH_3CH_2CH_3$ (17)  (18) $HCHO$

(19) $H_2C=CHCl$ (20) $H_2C=CHOC(=O)CH_3$

Question (2) : Among the compounds (1)–(20) shown above, two undergo the silver mirror reaction. Select the two compounds from (1) to (20).

Question (3) : What color precipitate is formed by the passage of acetylene gas into an aqueous solution of ammoniac silver nitrate? Choose from (1) to (5) shown below and write the number in the answer box.

Question (4) : What color precipitate is formed by the passage of acetylene gas into an aqueous solution of ammoniac copper (I) chloride? Choose from (1) to (5) shown below and write the number in the answer box.

(1) white (2) black (3) red

(4) blue (5) yellow

-2009 V

V Answer the questions (1) to (3).

(1) Which is correct as the nature of phenol? Select two from 1) to 6).

1) soluble in water, and neutral
2) insoluble in water
3) soluble in water, and acidic
4) soluble in water, and basic
5) undergoes silver mirror reaction
6) shows blue and purple when treated with iron (III) chloride aqueous solution

(2) Which is correct as the nature of ethanol? Select one from 1) to 6).

1) soluble in water, and neutral
2) insoluble in water
3) soluble in water, and acidic
4) soluble in water, and basic
5) undergoes silver mirror reaction
6) shows blue and purple when treated with iron (III) chloride solution

(3) What happens when phenol is treated with NaOH aqueous solution?

1) The product is soluble in water.
2) The product is precipitated.
3) Nothing happens.
4) It turns blue.
5) It turns yellow.

-2010 Q17

Q17 From ①–⑤ below choose the pair of compounds that are both hardly soluble in water.

17

① acetic acid and acetone
② aniline and ethanol
③ ethylene glycol and phenol
④ ethyl acetate and hexane
⑤ formaldehyde and naphthalene

-2010 Q18

Q18 Of the isomers with the molecular formula C_4H_8, from ①–⑥ below choose the correct combination of them that have the following properties (**a**) and (**b**). **18**

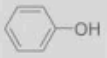
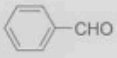
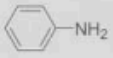
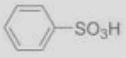
(**a**) Optical isomers are formed when the addition reaction of chlorine (Cl_2) takes place.

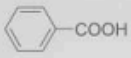
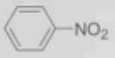
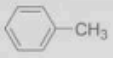
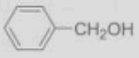
(**b**) There exist *cis* and *trans* isomers.

	a	b
①	1-butene (but-1-ene)	1-butene (but-1-ene)
②	1-butene (but-1-ene)	2-butene (but-2-ene)
③	1-butene (but-1-ene)	methylpropene
④	methylpropene	1-butene (but-1-ene)
⑤	methylpropene	2-butene (but-2-ene)
⑥	methylpropene	methylpropene

-2012 VI

VI Select the appropriate nature for the aromatic compounds (a)-(h) from (1)-(8).

(a)  (b)  (c)  (d) 

(e)  (f)  (g)  (h) 

(1) It is a neutral liquid and gives a negative result on the silver mirror test. It reacts with carboxylic acids to give esters.

(2) It is soluble in water and its aqueous solution is strongly acidic.

(3) It is slightly soluble in water and its aqueous solution is slightly acidic. It undergoes color reaction to blue purple with aqueous iron (III) chloride.

(4) It is neutral liquid, and it gives a positive silver mirror test result and a negative Fehling's test result.

(5) It is insoluble in water, but soluble in dilute hydrochloric acid. It undergoes a color reaction to reddish purple with aqueous calcium hypochlorite.

(6) It is insoluble in cold water, but soluble in hot water. It reacts with alcohol to give esters.

(7) It is insoluble in water and it gives a negative result on the silver mirror test. It is generally used as a solvent.

(8) It is insoluble in water and yellow. One of the derivatives is used as explosives.

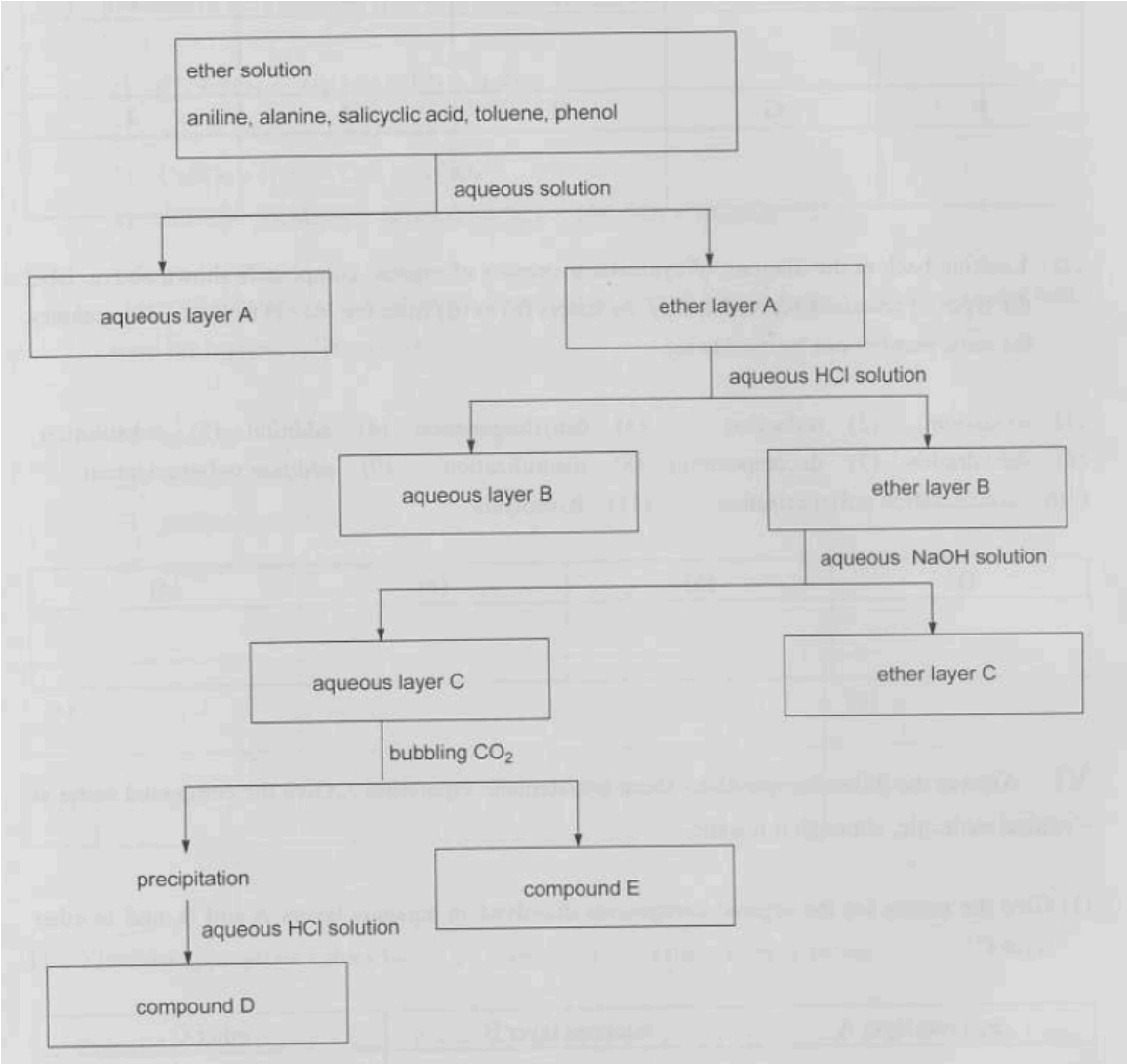
-2013 VI

VI Answer the following questions about a systematic separation. Give the compound name as a neutral molecule, although it is ionic.

(1) Give the names for the organic compounds dissolved in aqueous layers A and B, and in ether layer C.

(2) Give the name for the compound D.

(3) Give the name for the compound E.



-2013 VII(1)(3)

VII Write the name of organic compounds obtained from the following reactions.

(1) reaction of sodium acetate with sodium hydroxide

(3) heat ethanol at 160 °C

-2014 VI(2)-(3)

X is $C_5H_{12}O$

(2) The reaction of **X** with metallic sodium generates a gas. Which of the following gases are generated?
(a) oxygen (b) nitrogen (c) hydrogen chloride (d) chlorine (e) carbon dioxide (f) hydrogen

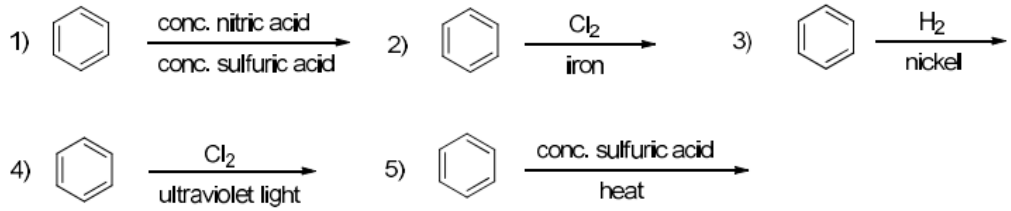
(3) Which of the following functional groups does **X** have?
(a) carboxylic acid (b) ester (c) alcohol (d) amine (e) aldehyde

-2015 V(5)-(6)

(5) Which of the substances 1) to 4) has the highest boiling point?

1) hexane 2) 1-pentanol 3) ethyl propyl ether 4) 3-pentanone

(6) Which reactions 1) to 5) result in an addition reaction? Choose two.



-2015 VI(1)(3)

VI Answer the following questions about phenol.

① It is soluble in water and its aqueous solution is neutral.

② Its aqueous solution is acidic.

③ Its aqueous solution is basic.

④ It undergoes silver mirror reaction.

⑤ It undergoes color reaction with aqueous iron (III) chloride to result in a bluish purple coloration.

⑥ It does not react with nitric acid.

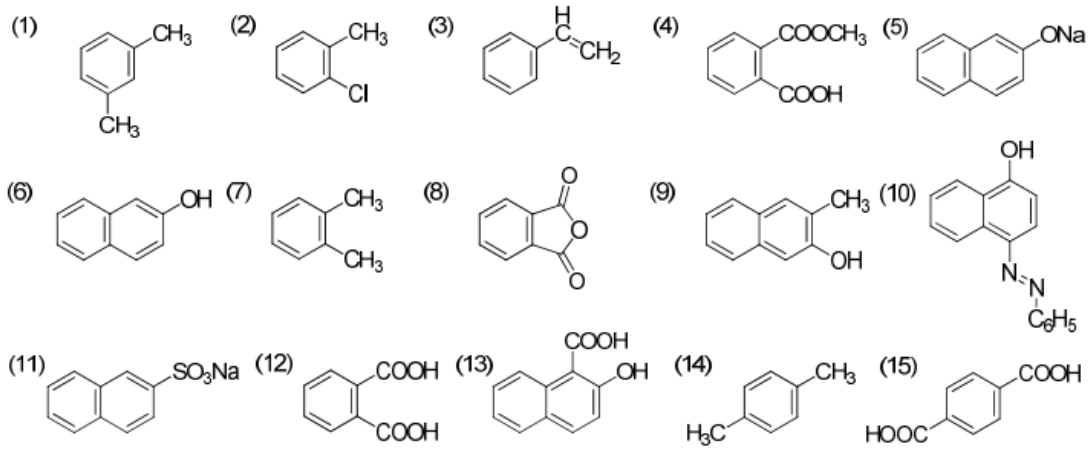
⑦ It easily reacts with hydrogen gas.

⑧ It reacts with Fehling's solution to reduce Cu^{2+}.

(1) Which of the descriptions ①—⑧ is correct for the property of phenol? Choose two.

(3) The reaction of phenol with sodium metal generates a gas. What is the gas? Give the appropriate name of the gas.

-2016 V(4)



(4) How many isomers exist for phthalic acids? Which has the highest melting point among the isomers? Select from (1)-(15) shown above.

-2016 V(5)

(5) Which of the descriptions 1) to 5) is not correct? Choose two.

1) Naphthalene is obtained by the fractional distillation of coal tar.
2) Naphthalene is not soluble in ethanol.
3) Naphthalene is an aromatic compound.
4) Naphthalene is a solid and easily sublimates.
5) Naphthalene has deliquescence.
6) Naphthalene easily undergoes electrophilic aromatic substitution.

-2017 V(3)-(4)

V There is a compound **A**, which is made up of carbon, hydrogen, and oxygen atoms. The reaction of the compound **A** with acetic acid gave an ester **B**. When 3.48 mg of the ester **B** was combusted completely, 7.92 mg of carbon dioxide and 3.24 mg of H_2O were obtained. A molecular weight of the ester **B** is between 110 and 118. Here, H=1, C=12, O=16.

B is $C_6H_{12}O_2$

(3) Select the functional group which is involved in the compound **A** from 1)-5).

1) aldehyde 2) ketone 3) alkene 4) alcohol 5) phenol

(4) Select the molecular formula of the compound **A** from 1)-5).

1) C_4H_7O 2) C_5H_9O 3) C_4H_8O 4) $C_4H_{10}O$ 5) $C_5H_{11}O$

-2017 VII(1)(2)

(1) Which of the descriptions 1) to 6) is correct for acetylene? Select two.

1) It is a linear molecule.
2) Cis and trans isomers exist.
3) It is obtained by the reaction of calcium carbonate with H_2O.
4) It has a regular tetrahedron structure.
5) It reacts with H_2O to give acetaldehyde.
6) It does not react with bromine.

(2) Which compound has only single bonds?

1) acetone 2) aniline 3) formic acid 4) cyclohexene 5) cyclohexane

-2018 VI(1)-(4),(6)

(1) There is a hydrocarbon that satisfies the following three conditions. What is the molecular formula of the hydrocarbon.

1) The compound is an alicyclic hydrocarbon consisting of one ring.
2) The compound contains two double bonds in the ring and all the remaining bonds are single bonds.
3) The compound contains four more hydrogen atoms than the number of carbon atoms.

(2) Which of the descriptions 1) to 6) are correct as characteristics of phenol? Select two.

1) insoluble in water 2) soluble in water and neutral 3) soluble in water and acidic 4) soluble in water and basic 5) undergo silver mirror reaction 6) show blue-violet when treated with iron(III) chloride solution

(3) Molecules 1) to 4) dissolve in ether. Which would move from the ether layer to the aqueous layer when a dilute hydrochloric acid solution is added to the ether solution, and the mixed solution is then shaken, and then left for a while until separation into two layers occurs?

1) benzene 2) phenol 3) benzoic acid 4) aniline

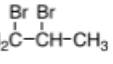
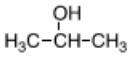
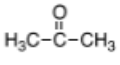
(4) Molecules 1) to 4) dissolve in ether. Which would move from the ether layer to the aqueous layer when an aqueous solution of sodium hydrogen carbonate is added to the ether solution, and the mixed solution is shaken, and then left for a while until separation into two layers occurs?

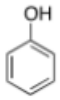
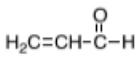
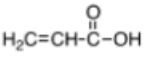
1) benzene 2) phenol 3) salicylic acid 4) nitrobenzene

(6) Which of the descriptions 1) to 6) are not correct. Select two.

1) The boiling points of carboxylic acids are higher than those of alcohols which have a similar molecular weight.
2) The melting points of carboxylic acids are lower than those of alcohols which have a similar molecular weight.
3) Carboxylic acids are stronger acids than carbonates.
4) Carboxylic acids easily form the dimers through hydrogen bonding.
5) Formic acid can function as a reducing reagent.
6) Acetic anhydride indicates acidity.

-2019 V(3)

A: 4)  B: 10)  C: 12)  D: 18) 

E: 20)  F: 9)  G: 11) 

(3) Which of pure compounds from **A** to **G** dissolved in diethyl ether give rise to H_2 when mixed with Na? Select all appropriate ones.

-2019 VI

VI Answer the following questions about separation of the four compounds described below.

1) benzoic acid 2) phenol 3) aniline 4) nitrobenzene

(1) Compounds 1) to 4) are dissolved in ether. After addition of dilute hydrochloric acid to the ether solution, the mixture is shaken and left for a while to give two layers, ether layer A and aqueous layer B. The separated aqueous layer B is mixed with ether and NaOH. After shaking the mixture, two layers (ether and aqueous layers) are observed. Which of the compounds 1) to 4) is included in the final ether layer?

(2) An aqueous solution of $NaHCO_3$ is added to ether layer A. The mixture is shaken and left for a while to give two layers, ether layer C and aqueous layer D. The separated aqueous layer D is mixed with ether and dilute hydrochloric acid. After shaking the mixture, two layers (ether and aqueous layers) are observed. Which of the compounds 1) to 4) is included in the final ether layer?

(3) An aqueous solution of NaOH is added to ether layer C. The mixture is shaken and left for a while to give two layers, ether layer E and aqueous layer F. The separated aqueous layer F is mixed with ether and dilute hydrochloric acid. After shaking the mixture, two layers (ether and aqueous layers) are observed. Which of the compounds 1) to 4) is included in the final ether layer?

(4) Which of the compounds 1) to 4) is included in the ether layer E?

(5) Which of the compounds 1) to 4) shows the strongest acidity?

(6) Compounds **X** and **Y** are among compounds 1) to 4). Compound **X** gives **Y** by reduction using Sn. What are compounds **X** and **Y**?

-2020 V(2)

There is compound **A**, which is made up of carbon, hydrogen, and oxygen atoms. When 50.5 mg of compound **A** was combusted completely with dry oxygen, 110 mg of CO_2 and 40.5 mg of H_2O were obtained. A complete hydrolysis of compound **A** gave compounds **B** and **C** at a 2:1 molar ratio. Compound **B** reacted with sodium to give hydrogen gas. When compound **B** was oxidized, compound **D**, which gives a positive Tollens' test (silver mirror test), was formed. Further oxidation of compound **D** produced compound **E**. Each of compounds **B** and **E** produced a yellow precipitate by the treatment with I_2 and $NaOH_{aq}$. Compound **C** is the starting material for nylon 6,6.

A is $C_{10}H_{18}O_4$

(2) Chose the appropriate structural formulas for compounds **B**, **C**, **D**, and **E** from options 1) to 20).

1) $CH_3CH_2CH_3$ 2) CH_3CH_3 3) CH_3CH_2OH 4) $CH_3CH_2OCH_2CH_3$ 5) $HOCH_2CH_2OH$

6) CH_3CHO 7) CH_3COOH 8) $CH_2{=}CHCH_2CH_3$ 9) $CH_3CH{=}CHCH_3$ 10) HCHO

11) CH_3CH_2COOH 12) $CH_3CH_2CH_2CH_2OH$ 13) $CH_3{-}\underset{\displaystyle Cl}{\underset{|}{CH}}{-}CH_2CH_3$ 14) $CH_3{-}\underset{\displaystyle O}{\underset{\|}{C}}{-}CH_2CH_3$

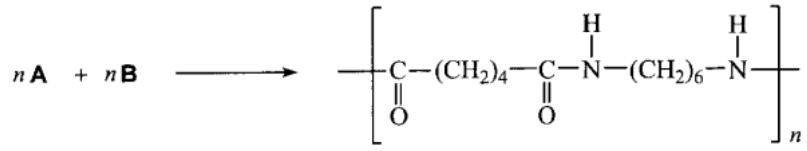
15) $CH_3{-}\underset{\displaystyle OH}{\underset{|}{CH}}{-}CH_2CH_3$ 16) $HO{-}\underset{\displaystyle O}{\underset{\|}{C}}{-}CH_2CH_2CH_2CH_2CH_2{-}\underset{\displaystyle O}{\underset{\|}{C}}{-}OH$ 17) $HO{-}\underset{\displaystyle O}{\underset{\|}{C}}{-}CH_2CH_2CH_2{-}\underset{\displaystyle O}{\underset{\|}{C}}{-}OH$

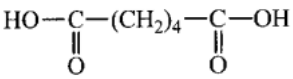
18) $HO{-}\underset{\displaystyle O}{\underset{\|}{C}}{-}CH_2CH_2CH_2CH_2{-}\underset{\displaystyle O}{\underset{\|}{C}}{-}OH$ 19) $HO{-}\underset{\displaystyle O}{\underset{\|}{C}}{-}CH_2CH{=}CH{-}CH_2{-}\underset{\displaystyle O}{\underset{\|}{C}}{-}OH$ 20) CO_2

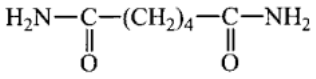
(3) Polymers

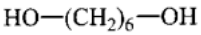
-2010 Q20

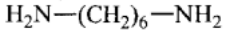
Q20 From ①-⑥ below choose the correct combination of compounds (**a**)-(**d**) which are appropriate as the starting compounds for the following synthesis of nylon-6,6. **20**



(**a**) 

(**b**) 

(**c**) 

(**d**) 

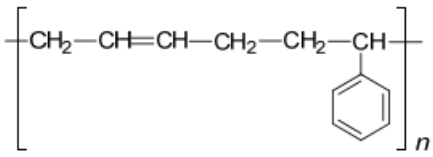
① **a**, **b** ② **a**, **c** ③ **a**, **d** ④ **b**, **c** ⑤ **b**, **d** ⑥ **c**, **d**

-2015 VI(5)

(5) Phenolic resin (Bekelite) is one of thermosetting resins. Which compound with phenol is required for the phenolic resin formation?

-2017 VII(3)

(3) Which of compounds 1) to 6) reacts with styrene to give the copolymer shown below?



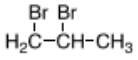
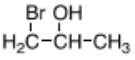
1) formaldehyde 2) isoprene 3) propylene 4) 2-butene 5) 1,3-butadiene 6) ethylene

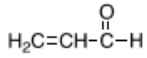
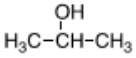
-2019 V(4)

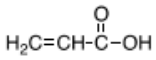
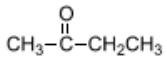
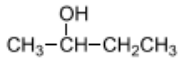
20) 

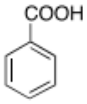
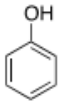
E:

(4) Compound **E** produces an industrially important thermosetting resin by condensation polymerization with a compound. Select the appropriate compound from options 1) to 20).

1) CH_3CH_2Cl 2) HCHO 3) CH_3CH_2OH 4)  5) 

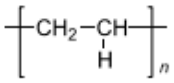
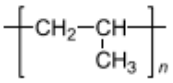
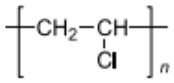
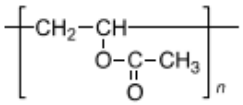
6) CH_3CHO 7) CH_3COOH 8) $CH_2=CHCH_2CH_3$ 9)  10) 

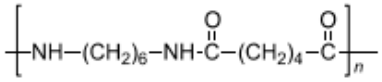
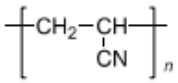
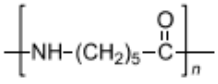
11)  12) 13)  14) 

15) CO_2 16) H_2 17) N_2 18)  19)  20) 

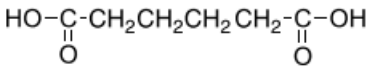
-2019 VII(1)

(1) The polymerization reaction of 219 g hexamethylene diamine with 219 g adipic acid gives a polymer. Select the structure of the polymer from 1) to 7).

1)  2)  3)  4) 

5)  6)  7) 

-2020 V(3)

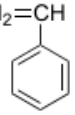
C: 

(3) Compound **F**, which has nitrogen atom(s), is used as another starting material with compound **C** for the synthesis of nylon 6,6. Write the appropriate values for *a*, *b*, and *c* in the molecular formula $C_aH_bN_c$ of Compound **F**.

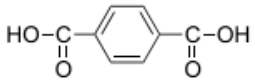
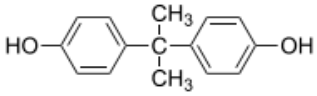
-2020 VI(1)(2)

(1) Choose the appropriate structural formulas for constituent monomer units of synthetic polymers a) to c) from options 1) to 14).

a) Polystyrene b) Polyvinyl chloride c) Polypropylene

1) $CH_2=CH_2$ 2) $CH_2=CHCH_3$ 3)  4) $CH_2=CHCl$

5) $CH_2=CHCN$ 6) $CH_2=CH-C(=O)-OH$ 7) $CH_2=CH-C(=O)-CH_3$

8)  9) $HO-C(=O)-CH_2CH_2CH_2CH_2-C(=O)-OH$ 10) 

11) $Cl-C(=O)-Cl$ 12) $CH_2(OH)-CH_2(OH)$ 13) $CH_2(OH)-CH_2-CH_2(OH)$ 14) $CH_2(OH)-CH(OH)-CH_2(OH)$

(2) Choose the appropriate structural formulas for the two constituent monomer units of polyethylene terephthalate from options 1) to 14) that are shown in question (1).

(4) Biological Chemistry

-2007 V Question 1

V Answer the following questions concerning oils and fats.

Question 1. Oils and fats are esters from higher fatty acids and [A]. The specific gravities of oils and fats are [B] than water, and oils and fats are insoluble in water but soluble in organic solvents. Oils and fats that are solid at ambient temperatures are called [C] and oils and fats that are liquid at ambient temperatures are called [D].

(1) Write the reference of the correct answer to [A].

(a) carboxylic acid (b) amine (c) glycerol (glycerin)

(d) glycol (e) halogen

(2) Select an appropriate word for [B].

(a) heavier (b) bigger (c) smaller

(d) higher (e) harder

(3) Select an appropriate word for [C].

(a) fatty oil (b) ether (c) margarine

(d) soap (e) fat

(4) Select an appropriate word for [D].

(a) fatty oil (b) ether (c) margarine

(d) soap (e) fat

-2014 VII

VII Answer the following questions about the amino acids ①–⑥.

① Alanine ② Glycine ③ Glutamic acid
④ Tyrosine ⑤ Methionine ⑥ Lysine

(1) Which of the descriptions (a) to (e) is not correct for the common properties of these amino acids?

(a) All are α-amino acids.
(b) Optical isomers (enantiomers) exist.
(c) All are water soluble.
(d) All consist of one amino group and one carboxylate group.
(e) All become purple when heated with ninhydrin test solution followed by cooling.

(2) Which has the smallest molecular weight?

(3) Which contains sulfur atoms?

(4) Which sodium salt is used as a synthetic seasoning?

(5) Which becomes yellow when heated with concentrated nitric acid?

-2015 V(7)-(8)

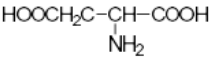
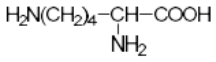
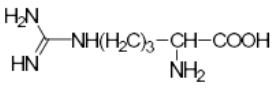
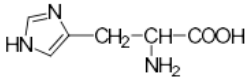
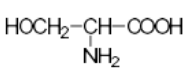
(7) How many structural isomers exist for dipeptides that are prepared from a mixture of alanine and glycine?

(8) Which sugars 1) to 5) are not reducing sugars?

1) sucrose 2) maltose 3) glucose 4) lactose 5) fructose

-2018 VI(5)

(5) Which of the amino acids 1) to 5) is a neutral amino acid?

1) 
2) 
3) 
4) 
5) 

-2019 VII(3)-(6)

(3) When a protein dissolved in water is treated with concentrated nitric acid at an elevated temperature, the color turns to yellow. Select the name of this reaction from 1) to 3).

1) Ninhydrin reaction 2) Xanthoproteic reaction 3) Biuret reaction

(4) Which of the amino acids 1) to 5) has the smallest molecular weight?

1) glycine 2) alanine 3) methionine 4) valine 5) phenylalanine

(5) Which of the amino acids 1) to 5) contains a sulfur in the molecule?

1) glycine 2) alanine 3) methionine 4) valine 5) phenylalanine

(6) Which of the amino acids 1) to 5) contains a benzene ring in the molecule?

1) glycine 2) alanine 3) methionine 4) valine 5) phenylalanine

-2020 VI(5)

(5) Iodine test is positive for amylose, but is negative for cellulose. Chose the appropriate reason for this difference from options 1) to 4).

1) Cellulose has a helical structure, while amylose does not.
2) Amylose has a helical structure, while cellulose does not.
3) Amylose is stable, while cellulose is not.
4) Cellulose is stable, while amylose is not.