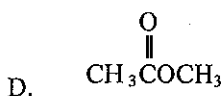
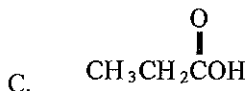
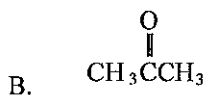
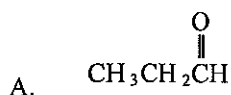


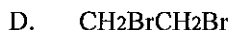
# PAST IB TEST QUESTIONS - TOPIC 10

Name \_\_\_\_\_

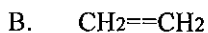
1. Which of the structures below is an aldehyde?



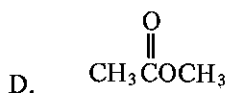
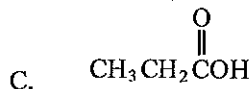
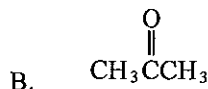
2. What product results from the reaction of  $\text{CH}_2=\text{CH}_2$  with  $\text{Br}_2$ ?



3. What is the final product formed when  $\text{CH}_3\text{CH}_2\text{OH}$  is refluxed with acidified potassium dichromate(VI)?



4. Which of the substances below is **least** soluble in water?



5. Which substance(s) could be formed during the incomplete combustion of a hydrocarbon?

I. Carbon

II. Hydrogen

III. Carbon monoxide

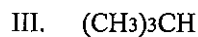
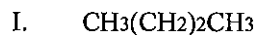
A. I only

B. I and II only

C. I and III only

D. II and III only

6. Which formulas represent butane or its isomer?



A. I and II only

B. I and III only

C. II and III only

D. I, II and III

7. Which compound can exist as optical isomers?

- A.  $\text{CH}_3\text{CHBrCH}_3$
- B.  $\text{CH}_2\text{BrCHBrCH}_3$
- C.  $\text{CH}_2\text{BrCHBrCH}_2\text{Br}$
- D.  $\text{CHBr}_2\text{CHBrCHBr}_2$

8. Which statement about the reactions of halogenoalkanes with aqueous sodium hydroxide is correct?

- A. Primary halogenoalkanes react mainly by an  $\text{S}_{\text{N}}1$  mechanism.
- B. Chloroalkanes react faster than iodoalkanes.
- C. Tertiary halogenoalkanes react faster than primary halogenoalkanes.
- D. The rate of an  $\text{S}_{\text{N}}1$  reaction depends on the concentration of aqueous sodium hydroxide.

9. Which type of compound must contain a minimum of three carbon atoms?

- A. An aldehyde
- B. A carboxylic acid
- C. An ester
- D. A ketone

10. What is the IUPAC name for  $\text{CH}_3\text{CH}_2\text{CH}(\text{CH}_3)_2$ ?

- A. 1,1-dimethylpropane
- B. 2-methylbutane
- C. isopentane
- D. ethyldimethylmethane

11. Which product is formed by the reaction between  $\text{CH}_2\text{CH}_2$  and  $\text{HBr}$ ?

- A.  $\text{CH}_3\text{CH}_2\text{Br}$
- B.  $\text{CH}_2\text{CHBr}$
- C.  $\text{BrCHCHBr}$
- D.  $\text{CH}_3\text{CHBr}_2$

12. Which reaction(s) involve(s) the formation of a positive ion?

- I.  $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br} + \text{OH}^-$
- II.  $(\text{CH}_3)_3\text{CBr} + \text{OH}^-$

- A. I only
- B. II only
- C. Both I and II
- D. Neither I nor II

13. Consider the following compounds.

- I.  $\text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}_3$
- II.  $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_2\text{OH}$
- III.  $(\text{CH}_3)_3\text{COH}$

The compounds are treated separately with acidified potassium dichromate(VI) solution. Which will produce a colour change from orange to green?

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

14. Which compound reacts most rapidly by a  $S_N1$  mechanism?

- A.  $(CH_3)_3CCl$
- B.  $CH_3CH_2CH_2CH_2Br$
- C.  $(CH_3)_3CBr$
- D.  $CH_3CH_2CH_2CH_2Cl$

15. Which compound is a member of the same homologous series as 1-chloropropane?

- A. 1-chloropropene
- B. 1-chlorobutane
- C. 1-bromopropane
- D. 1,1-dichloropropane

16. What is the organic product of the reaction between ethanol and ethanoic acid?

- A.  $CH_3CHO$
- B.  $CH_3COOCH_3$
- C.  $CH_3CH_2COOCH_3$
- D.  $CH_3COOCH_2CH_3$

17. Which statement is correct about the reaction between methane and chlorine?

- A. It involves heterolytic fission and  $Cl^-$  ions.
- B. It involves heterolytic fission and  $Cl\cdot$  radicals.
- C. It involves homolytic fission and  $Cl^-$  ions.
- D. It involves homolytic fission and  $Cl\cdot$  radicals.

18. Which compound is converted to butanal by acidified potassium dichromate(VI) solution?

- A. butan-1-ol
- B. butan-2-ol
- C. butanone
- D. butanoic acid

19. Which formula represents a tertiary alcohol?

- A.  $\begin{array}{c} CH_3-CH-CH_2-CH_3 \\ | \\ CH_2OH \end{array}$       B.  $\begin{array}{c} CH_3-CH-CH_2-CH_2-OH \\ | \\ CH_3 \end{array}$
- C.  $\begin{array}{c} CH_3 \\ | \\ CH_3-C-CH_2-CH_3 \\ | \\ OH \end{array}$       D.  $\begin{array}{c} CH_3 \\ | \\ CH_3-CH-CH-CH_3 \\ | \\ OH \end{array}$

20. Which reaction type is typical for halogenoalkanes?

- A. nucleophilic substitution
- B. electrophilic substitution
- C. electrophilic addition
- D. nucleophilic addition

21. Which substance is **not** readily oxidized by acidified potassium dichromate(VI) solution?

- A. propan-1-ol
- B. propan-2-ol
- C. propanal
- D. propanone

22. Which are characteristics typical of a free radical?

- I. It has a lone pair of electrons.
- II. It can be formed by the homolytic fission of a covalent bond.
- III. It is uncharged.

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

23. Which pair of compounds can be used to prepare  $\text{CH}_3\text{COOCH}_3$ ?

- A. Ethanol and methanoic acid
- B. Methanol and ethanoic acid
- C. Ethanol and ethanoic acid
- D. Methanol and methanoic acid

24. What is the reaction type when  $(\text{CH}_3)_3\text{CBr}$  reacts with aqueous sodium hydroxide to form  $(\text{CH}_3)_3\text{COH}$  and  $\text{NaBr}$ ?

- A. Addition
- B. Elimination
- C.  $\text{S}_{\text{N}}1$
- D.  $\text{S}_{\text{N}}2$

25. Which species is a free radical?

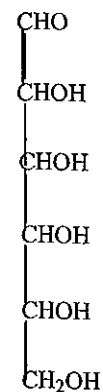
- A.  $\bullet\text{CH}_3$
- B.  $+\text{CH}_3$
- C.  $-\text{CH}_3$
- D.  $:\text{CH}_3$

26. Nylon is a condensation polymer made up of hexanedioic acid and 1,6-diaminohexane. Which type of linkage is present in nylon?

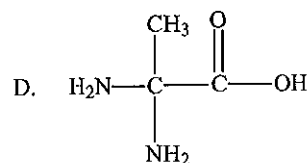
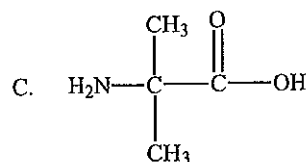
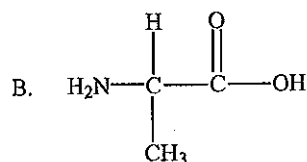
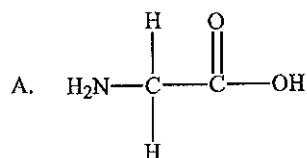
- A. Amide
- B. Ester
- C. Amine
- D. Carboxyl

27. How many chiral carbon atoms are present in a molecule of glucose?

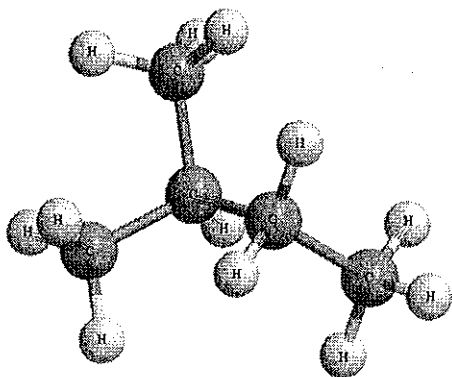
- A. 1
- B. 2
- C. 3
- D. 4



28. Which amino acid can exist as optical isomers?



29. The following is a three-dimensional representation of an organic molecule.



Which statement is correct?

- A. The correct IUPAC name of the molecule is 2-methylpentane.
- B. All the bond angles will be approximately  $90^\circ$ .
- C. One isomer of this molecule is pentane.
- D. The boiling point of this compound would be higher than that of pentane.

30. What is the product of the following reaction?



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

31. (i) A compound **D** has the molecular formula  $\text{C}_2\text{H}_4\text{O}_2$  and is obtained from a reaction between methanoic acid and methanol. Write an equation for this reaction and state the name of **D**.

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 .....

(3)

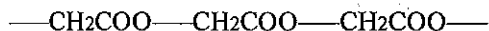
(ii) A second compound, **E**, has the same molecular formula as **D** and has acidic properties.

State the name of compound **E**.

.....

(1)

32. The first synthetic thread was made from a polyester. A section of the polyester is drawn below:



- (i) Give the structural formula of the monomer (containing two functional groups) that could be used to make this polyester and state the names of the two functional groups.

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.....  
.....  
.....  
.....

(3)

- (ii) State, giving a reason, whether this polyester is made by a condensation reaction or an addition reaction.

.....  
.....

(2)

33. Hexanedioic acid and 1,6-diaminohexane react together to form a synthetic polymer. There are many natural polymers, some of the most familiar being proteins formed from 2-amino acids.

- (i) Give the structural formula of each monomer in the synthetic polymer.

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.....  
.....  
.....

(2)

- (ii) State the type of polymerization reaction that occurs between these two monomers and identify the structural feature needed in the monomers.

.....

(2)

- (iii) Draw the structure of and state the type of linkage formed in this polymer, and identify the other product of this polymerization reaction.

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(3)

- (iv) The structures of some 2-amino acids are shown in Table 20 of the Data Booklet. Using alanine as an example, explain what is meant by the term *optical activity*, identify the structural feature that needs to be present and illustrate your answer with suitable diagrams of both isomers.

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(3)

- (v) Identify a 2-amino acid from Table 20 which does **not** show optical activity.

.....

(1)

- (vi) Polyesters are formed in a similar polymerization reaction to proteins. Their monomers are esters. State **one** use of esters and identify the **two** compounds that react together to form the ester ethyl methanoate.

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(3)

34. The compound, 2-bromobutane,  $\text{CH}_3\text{CHBrCH}_2\text{CH}_3$ , can react with sodium hydroxide to form compounds **F**, **G** and **H**.

Compound **F**,  $\text{C}_4\text{H}_{10}\text{O}$ , exists as a pair of optical isomers. Compounds **G** and **H**,  $\text{C}_4\text{H}_8$ , are structural isomers, and compound **H** exists as a pair of geometrical isomers.

- (i) Draw the structures of the two optical isomers of **F**.

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.....

(2)

- (ii) Outline the use of a polarimeter in distinguishing between the optical isomers.

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(2)

(iii) Draw diagrams to show the shapes of the two geometrical isomers of H.

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(2)

35. (a) There are **geometrical** isomers of the cyclic compound  $C_4H_6Cl_2$ . Draw the structural formula of two isomers and explain why these two isomers exist.

cis-isomer

trans-isomer

.....  
.....

(3)

(b) (i) Draw the structural formulas of **two** isomers of but-2-ene-1,4-dioic acid.

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(2)

(ii) State and explain which isomer will have a lower melting point.

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(2)



(c) Consider the following compounds:  
1-chloropentane, 2-chloropentane, 3-chloropentane

(i) Identify the compound which exhibits optical isomerism and draw the structures of the **two** isomers.

.....

(3)

(ii) Describe how these **two** isomers can be distinguished experimentally.

.....

(1)

36. (i) Ethanoic acid reacts with ethanol in the presence of concentrated sulfuric acid and heat. Identify the type of reaction that takes place. Write an equation for the reaction, name the organic product formed and draw its structure.

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(4)

(ii) State and explain the role of sulfuric acid in this reaction.

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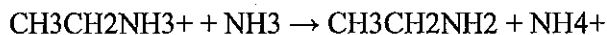
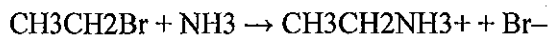
(2)

(iii) State **one** major commercial use of the organic product from this type of reaction.

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.....

(1)

37. Bromoethane reacts with ammonia as follows.



The mechanism for this reaction is described as  $\text{S}_{\text{N}}2$ .

(a) State the meaning of each of the symbols in  $\text{S}_{\text{N}}2$ .

.....  
.....

(2)

(b) State the name of the organic product of the reaction,  $\text{CH}_3\text{CH}_2\text{NH}_2$ .

.....

(1)

- Know properties of benzene
- Naming of all functional groups + substituents in 10.1
  - numbering
  - suffix
  - prefix
  - stem
  - 1°, 2°, 3°
- Isomers / types of structures
- Homologous series
- Trends