

1. A sample of 0.205g of an organic compound was subjected to combustion analysis and produced 0.660g of carbon dioxide, 0.225g of water and nothing else. Its RMM is 82.
 - (a) Calculate the empirical formula of the compound.
 - (b) Calculate the molecular formula of the compound.
2. A sample of 0.400g of an organic compound was subjected to combustion analysis and produced 1.257g of carbon dioxide, 0.514g of water and nothing else. Its RMM is 84.
 - (a) Calculate the empirical formula of the compound.
 - (b) Calculate the molecular formula of the compound.
3. A sample of 0.500g of an organic compound was subjected to combustion analysis and produced 0.733g of carbon dioxide, 0.300g of water and nothing else. Its RMM is 90.
 - (a) Calculate the empirical formula of the compound.
 - (b) Calculate the molecular formula of the compound.
4. A sample of 0.200g of an organic compound was subjected to combustion analysis and produced 0.455g of carbon dioxide, 0.186g of water and nothing else. Its RMM is 116.
 - (a) Calculate the empirical formula of the compound.
 - (b) Calculate the molecular formula of the compound.
5. Name the functional groups in these compounds:
 - (a) $\text{CH}_3\text{-CH}_2\text{-CH=CH-CH}_3$
 - (b) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-OH}$
 - (c) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-O-CH}_2\text{-CH}_2\text{-CH}_3$
6. Identify the functional groups in these compounds:
 - (a) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-OH}$
 - (b) $\text{CH}_3\text{-CH}_2\text{-CH=CH}_2$
 - (c) $\text{CH}_3\text{-CH}_2\text{-O-CH}_2\text{-CH}_2\text{-CH}_3$
7. Name the functional groups in these compounds:
 - (a) $\text{CH}_2\text{=CH-CH}_2\text{-CH}_2\text{-CH}_3$
 - (c) $\text{CH}_3\text{-CH}_2\text{-O-CH}_2\text{-CH}_3$
 - (d) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-NH}_2$

8. Identify the functional groups in these compounds:

- (a) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-NH}_2$
- (b) $\text{CH}_3\text{-CH}_2\text{-OH}$
- (c) $\text{CH}_3\text{-CH}_2\text{-CH=CH-CH}_2\text{-CH}_3$

9. Draw these compounds:

- (a) 3,3-dimethylpentane
- (b) 4-ethyl-4-methyloctane
- (c) 4-methylhexan-3-ol

10. Draw these compounds:

- (a) 2,2-dimethylbutane
- (b) 3-ethyl-5-methylheptane
- (c) 3-methylbutan-2-ol

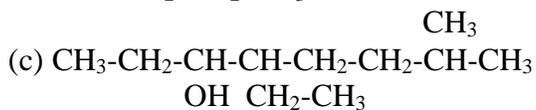
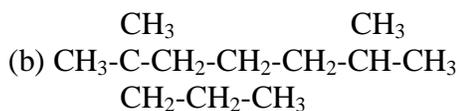
11. Draw these compounds:

- (a) 2,3-dimethylbutane
- (b) 4-ethyl-2-methyloctane
- (c) 2-methylpentan-3-ol

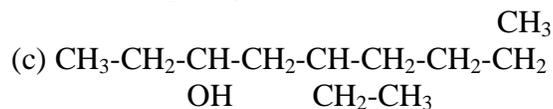
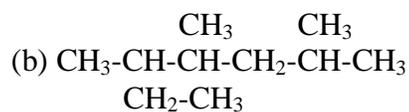
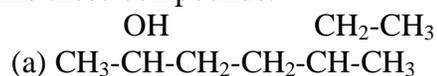
12. Draw these compounds:

- (a) 2,2,3-trimethylpentane
- (b) 4-ethyloctane
- (c) 2-methylpropan-2-ol

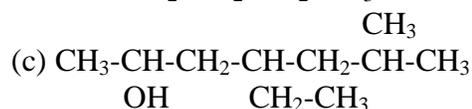
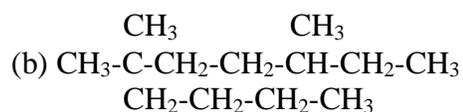
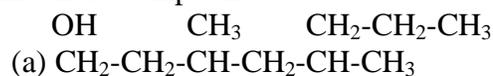
13. Name these compounds:



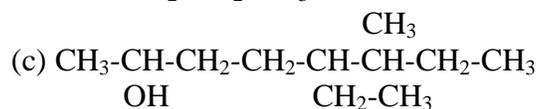
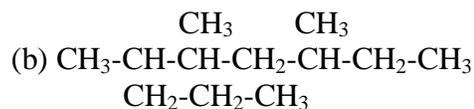
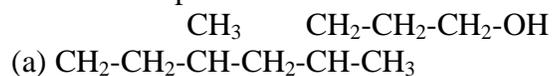
14. Name these compounds:



15. Name these compounds:



16. Name these compounds:



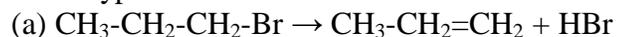
17. Draw three isomers of $\text{C}_3\text{H}_8\text{O}$.

18. Draw three isomers of $\text{C}_4\text{H}_{10}\text{O}$.

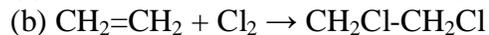
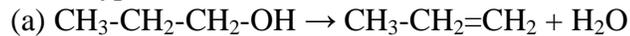
19. Draw three isomers of $\text{C}_5\text{H}_{12}\text{O}$.

20. Draw three isomers of C_5H_{12} .

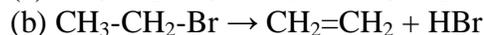
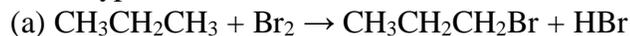
21. Write the type of reaction:



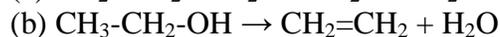
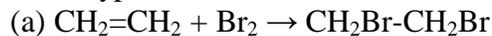
22. Write the type of reaction:



23. Write the type of reaction:



24. Write the type of reaction:



25. Write the definition of an electrophile.

26. Write the definition of homolytic fission.

27. Write the definition of a nucleophile.

28. Write the molecular formula of an alkane with 17 carbons.

29. Write the molecular formula of an alkane with 14 carbons.

30. Write the molecular formula of an alkane with 13 carbons.

31. Write the molecular formula of an alkane with 15 carbons.

32. Write the definition of a free radical.

33. Name 3 fractions of crude oil and give a use for each.

34. Draw these compounds:

(a) 4-ethyl-4-methylheptane

(b) trans-2-methylhex-3-ene

(c) pent-1-yne

(d) 3-chloro-1,4-dimethylbenzene

35. Draw these compounds:

(a) 3,4-dimethyloctane

(b) cis-2-methylhept-3-ene

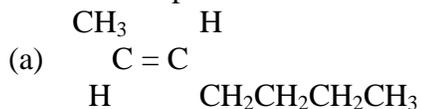
(c) hex-3-yne

(d) 2,4-dichloromethylbenzene

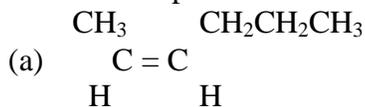
36. Draw these compounds:

- (a) 4-ethyl-2-methyloctane
- (b) cis-4-methylpent-2-ene
- (c) hex-3-yne
- (d) 3,5-dinitromethylbenzene

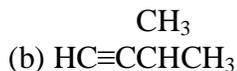
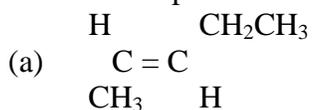
37. Name these compounds:



38. Name these compounds:



39. Name these compounds:



40. Hexane reacts with bromine under certain conditions.

- (a) What type of reaction is this?
- (b) Write the overall equation for this reaction.
- (c) What conditions allow this reaction to happen?
- (d) Write the full mechanism for this reaction, giving the name of each of the three stages and all of the equations.

41. Pentane reacts with bromine under certain conditions.

- (a) What conditions allow this reaction to happen?
- (b) What type of reaction is this?
- (c) Write the overall equation for this reaction.
- (d) Write the full mechanism for this reaction, giving the name of each of the three stages and all of the equations.

42. Propane reacts with chlorine under certain conditions.
- (a) Write the overall equation for this reaction.
 - (b) What type of reaction is this?
 - (c) What conditions allow this reaction to happen?
 - (d) Write the full mechanism for this reaction, giving the name of each of the three stages and all of the equations.
43. Pent-1-ene reacts with bromine.
- (a) Write the overall equation for this reaction. (3)
 - (b) Name the product. (2)
 - (c) Draw the carbocation formed half way through the reaction.
44. Propene reacts with water.
- (a) Write the overall equation for this reaction. (3)
 - (b) Name a product. (2)
 - (c) Draw a carbocation formed half way through the reaction.
45. Prop-1-ene reacts with hydrogen chloride.
- (a) Write the overall equation for this reaction.
 - (b) Name the product.
 - (c) Draw the carbocation formed half way through the reaction.
46. Write a polymerisation equation for hex-2-ene.
47. Describe the chemical test used to identify alkenes.
48. Write a polymerisation equation for pent-2-ene.
49. Write a balanced equation for the complete combustion of heptane.
50. Write a balanced equation for the complete combustion of pentane.
51. Write a balanced equation for the complete combustion of octane.
52. Explain what 'cracking' is and why we do it to crude oil fractions.
53. Write a polymerisation equation for pent-1-ene.