Mole Concept & Stoichiometry

1. What does one mole of a substance always contain?

   A. 6.02×10^{22} particles

   B. 6.02×10^{23} particles

   C. 1.00 dm^3 of gas

   D. 24.0 dm^3 of gas

2. Which expression is used to calculate the number of moles from mass?

   A. mass × molar mass

   B. mass ÷ molar mass

   C. molar mass ÷ mass

   D. mass × Avogadro’s constant

3. At RTP, the volume occupied by 1 mole of any gas is

   A. 22.4 dm^3

   B. 24.0 dm^3

   C. 6.02 dm^3

   D. 1.00 dm^3

4. The empirical formula of a compound represents:

   A. The total number of atoms

   B. The actual molecular mass

   C. The simplest whole-number ratio of atoms

D. The structural arrangement

5. Which step must be done FIRST in any stoichiometric calculation?

A. Convert mass to moles

B. Identify the limiting reagent

C. Balance the chemical equation

D. Calculate percentage yield

6. Which substance is the limiting reagent?

A. The one with the largest mass

B. The one in excess

C. The one that reacts completely first

D. The product formed

7. Percentage yield is calculated using:

A. theoretical ÷ actual × 100

B. actual ÷ theoretical × 100

C. mass ÷ volume × 100

D. moles × molar mass

8. If the percentage yield is less than 100%, this usually indicates:

A. Reaction was reversible

B. Measurement error only

C. Product loss or side reactions

D. Excess reactant was used

9. Atom economy measures:

A. Reaction speed

B. Reaction yield

C. Efficiency of atom usage

D. Reaction equilibrium

10. A reaction with high atom economy is considered:

A. Dangerous

B. Reversible

C. Environmentally friendly

D. Slow

11. Which unit is correct for concentration?

A. g dm^{-3}

B. mol g^{-1}

C. mol dm^{-3}

D. dm^3 mol^{-1}

12. Which quantity changes when converting moles to mass?

A. Avogadro’s constant

B. Chemical formula

C. Molar mass

D. Number of particles

13. Which gas volume should be used at STP?

A. 24.0 dm^3

B. 22.4 dm^3

C. 1.00 dm^3

D. 6.02 dm^3

14. Which is required to calculate the molecular formula from the empirical formula?

A. Percentage composition

B. Relative atomic mass

C. Relative molecular mass

D. Balanced equation

15. Which always remains constant in a balanced equation?

A. Mass of reactants

B. Number of atoms

C. Volume of gases

D. Number of moles

Acids, Bases & pH

16. According to the Brønsted–Lowry theory, an acid is a:

A. Proton acceptor

B. Electron donor

C. Proton donor

D. Hydroxide producer

17. Which species is the conjugate base of HCl?

A. H_3O^+

B. Cl^-

C. OH^-

D. H_2O

18. Strong acids differ from weak acids because they:

A. Are more concentrated

B. Ionise completely in water

C. Have lower pH values always

D. Contain more hydrogen

19. A solution with pH = 3 is:

A. Neutral

B. Weakly acidic

C. Strongly acidic

D. Alkaline

20. Each decrease of 1 pH unit represents:

A. 2× increase in $[H^+]$

B. 5× increase in $[H^+]$

C. 10× increase in $[H^+]$

D. 100× increase in $[H^+]$

21. The pH scale is described as:

A. Linear

B. Exponential

C. Logarithmic

D. Quadratic

22. A solution with high pH has:

A. High $[H^+]$

B. Low $[H^+]$

C. No ions

D. Neutral charge

23. pH + pOH always equals:

A. 7

B. 10

C. 12

D. 14

24. Which indicator turns pink in an alkaline solution?

A. Litmus

B. Methyl orange

C. Phenolphthalein

D. Universal indicator

25. A neutralisation reaction always forms:

A. Salt only

B. Water only

C. Acid and base

D. Salt and water

26. The equivalence point of a strong acid–strong base titration is at pH:

A. 3

B. 5

C. 7

D. 9

27. Buffers resist changes in pH by:

A. Removing water

B. Neutralising strong acids only

C. Removing added H^+ or OH^-

D. Increasing temperature

28. A buffer solution is made from:

A. Strong acid + strong base

B. Weak acid + its salt

C. Strong acid + water

D. Strong base + salt

29. Which ion causes acidity in aqueous solutions?

A. OH^-

B. H_2O

C. H^+

D. Na^+

30. A dilute strong acid can have a higher pH than a concentrated weak acid because:

A. Strength depends on volume

B. pH depends on $[H^+]$

C. Weak acids are neutral

D. Strong acids react faster

Organic Chemistry

31. A hydrocarbon contains only:

A. C and O

B. C and H

C. H and O

D. C, H, and O

32. Which homologous series contains only single bonds?

A. Alkenes

B. Alkynes

C. Alkanes

D. Alcohols

33. The functional group of an alcohol is:

A. –COOH

B. $–NH_2$

C. –OH

D. –CHO

34. Alkenes undergo which type of reaction?

A. Substitution

B. Addition

C. Elimination

D. Condensation

35. Which molecule is unsaturated?

A. Ethane

B. Ethene

C. Methane

D. Propane

36. The suffix for carboxylic acids is:

A. –ol

B. –one

C. –al

D. –oic acid

37. Which reaction forms an alkene from an alcohol?

A. Oxidation

B. Addition

C. Elimination

D. Substitution

38. Oxidation of ethanol produces:

A. Ethane

B. Ethene

C. Ethanal/ethanoic acid

D. Methanol

39. Reduction involves:

A. Gain of oxygen

B. Loss of hydrogen

C. Gain of hydrogen

D. Loss of electrons only

40. Which condition is required for elimination of haloalkanes?

A. Cold dilute NaOH

B. Warm aqueous NaOH

C. Hot alcoholic NaOH

D. UV light

41. Addition polymerisation requires monomers with:

A. –OH groups

B. –COOH groups

C. C=C bonds

D. $–NH_2$ groups

42. Condensation polymerisation always produces:

A. CO_2

B. Water or HCl

C. Oxygen

D. Hydrogen

43. Which bond forms in polyesters?

A. C–C

B. Ester linkage

C. Amide linkage

D. Hydrogen bond

44. Benzene is stable due to:

A. Sigma bonds only

B. Delocalised π electrons

C. Triple bonds

D. Ionic bonding

45. Which reaction preserves the aromatic ring?

A. Addition

B. Substitution

C. Elimination

D. Polymerisation

46. Which reagent is used for free-radical substitution?

A. NaOH

B. HBr

C. Cl_2 + UV

D. H_2SO_4

47. Isomers have the same:

A. Structure

B. Functional group

C. Molecular formula

D. Empirical formula only

48. The general formula of alkenes is:

A. C□H_2□$_{+2}$

B. C□H_2□

C. C□H_2□$_{-2}$

D. C□H□

49. Which compound can form hydrogen bonds?

A. Ethane

B. Ethene

C. Ethanol

D. Ethyne

50. Reflux is used to:

A. Increase yield by cooling

B. Prevent reactant loss during heating

C. Speed up filtration

D. Separate products

Markscheme:

1. B
2. B
3. B
4. C
5. C
6. C
7. B
8. C
9. C
10. C
11. C
12. C
13. B
14. C
15. B
16. C
17. B
18. B
19. C
20. C
21. C
22. B
23. D
24. C
25. D
26. C
27. C
28. B
29. C
30. B
31. B
32. C
33. C
34. B
35. B
36. D
37. C
38. C
39. C
40. C
41. C
42. B
43. B
44. B
45. B
46. C
47. C
48. B
49. C
50. B