Quant booklet answers

1. –
   1. 28
   2. 40
   3. 34
   4. 64
   5. 62
   6. 102
   7. 78
   8. 148
   9. 159.5
   10. 174
   11. 342
2. - C6H6O6
   1. 263
   2. 408
3. –
   1. 24
   2. 36
   3. 3
   4. 54
   5. 288
   6. 1008
   7. 12
   8. 260
4. –
   1. 6.022x1023
   2. 1.2044x1024
   3. 4.2154x1024
   4. 3.011x1023
   5. 7.2264x1024
   6. 1.2044x1025
5. –
   1. 6.022x1023
   2. 6.022x1023
   3. 1.5055x1024
6. Given
   1. 1.8066x1024
   2. 7.2264x1024
   3. 1.32484x1025
   4. 3.011x1024
7. 31
8. –
   1. 2.96
   2. 2.08
   3. 2.44
   4. 1.30
   5. 1.34
   6. 0.81
   7. 1.06
   8. 0.56
   9. 0.52
   10. 0.48
   11. 0.24
9. –
   1. 355g
   2. 20.4g
   3. 1.08g
   4. 0.264g
   5. 31.8g
10. 176.06
11. –
    1. 7
    2. 14
    3. 100
    4. 117
    5. 15
    6. 2
    7. 4
    8. 1.004x1023
12. –
    1. 48
    2. 306
    3. 138
13. –
    1. 6
    2. 28
    3. 63
    4. 22
14. –
    1. 132
    2. 165
    3. 36
    4. 289
15. –
    1. CH4 + 2O2 🡪 CO2 + 2H2O
    2. 12 moles O2
    3. 12 moles water
16. –
    1. 2C2H6 + 7O2 🡪 4CO2 + 6H2O
    2. 4 moles CO2
    3. 21 moles H2O
    4. 16.29 moles H2O
    5. 14.33 moles of C2H6 and 50.17 moles O2
17. –
    1. S8 + 12O2 🡪 8SO3
    2. 1.5 moles S8
    3. 204 moles O2
    4. 136 moles SO3
18. –
    1. 115.14g
    2. 123.16g
    3. 23.42g
19. –
    1. 107.14g
    2. 1400g
    3. 2.87g
20. –
    1. 98.48g
    2. 37.28g
    3. 50.70g
21. –
    1. 3863.89g
    2. 151.86g
22. –
    1. 7.33g
    2. 0.38g
23. 16.55g
24. 2KNO3 🡪 2KNO2 + O2
25. 2Fe2O3 + 3C 🡪 4Fe + 3CO2
26. X = 4, y = 10
27. –
    1. N2 3H2 🡪 2NH3
    2. –
       1. N2 is excess, H2 is limiting
       2. H2 limiting
       3. N2 limiting
    3. –
       1. H2 limiting, 2 moles NH3 produced
       2. N­2 limiting, 6 moles NH3 produced
       3. N2 limiting, 1 mole NH3 produced
28. –
    1. 2SO2 + O2 🡪 2SO3
    2. –
       1. SO2 limiting
       2. SO2 limiting
       3. O2 limiting
29. Fe limiting
30. CaO limiting
    1. O2 limiting
    2. 13.75g
    3. Fe limiting
    4. 72.21g
31. Mg limiting, mass of Ti = 100g
32. SO2 limiting, 1250g SO3 produced
33. NaOCl limiting, 42.95g N2H4
34. All in dm3
    1. 0.01
    2. 0.1
    3. 0.2
    4. 0.00003
    5. 0.73
    6. 1.9
35. All in cm3
    1. 1000
    2. 10,000
    3. 70,000
    4. 800
36. All in g/dm3
    1. 114.29
    2. 1298.70
    3. 4
    4. 115.38
37. All in g/dm3
    1. 1095
    2. 1514.67
    3. 840
    4. 303.61
38. All in dm3
    1. 2.44
    2. 830
    3. 1
    4. 1.05
39. All in g
    1. 0.0575
    2. 17.75
    3. 140.3
40. 2Al(OH)3 + 3H2SO4 🡪 Al2(SO4)3 + 6H2O
41. 778.81g/dm3
42. 0.449 moles
43. 0.224 moles
44. 4.41g
45. H2SO4 limiting

Summary problem

1. 3Na + AlCl3 🡪 3NaCl + Al
2. Reactants: sodium, aluminium chloride, Products: sodium chloride, aluminium  
   Elements: sodium, aluminium, compounds aluminium chloride and sodium chloride
3. When a more reactive element takes the place of a less reactive element in a compound
4. That sodium is more reactive than aluminium
5. –
   1. Sodium: 2,8,1  
      Potassium: 2,8,8,1
   2. Potassium has more shells  
      Outer electron further away from the nucleus  
      More shielding   
      Weaker electrostatic force of attraction nucleus 🡪 outer shell  
      Easier to lose the electron
6. It is a metal  
   Positive ions (in layers)  
   With delocalised electrons  
   Which can move and carry charge
7. It is a giant ionic lattice  
   Ions are fixed in positions  
   Not free to move and carry charge
8. Dissolve it in water or melt it
9. Ions are free to move  
   and carry charge
10. –
    1. Simple molecular/covalent/small molecules  
       covalent bonds between chlorine atoms  
       intermolecular force between molecules
    2. Two electrons in the bond, one from each chlorine, must be shared (only outer shell required)
    3. It is a simple molecular substance  
       Weak intermolecular forces between molecules  
       Does not require a lot of energy to break
    4. Giant ionic lattice  
       aluminium ions and chloride ions held together by the electrostatic force of attraction  
       Which is strong  
       requires a lot of energy to break
11. Aluminium loses three electrons, gives one to each of three chlorine atom
12. Aluminium needs to lose three electrons but sodium only loses one
13. Na+, Al3+
14. 10
15. 150
16. 6.022x1024
17. Na: 23, AlCl3: 133.5, NaCl: 58.5, Al: 27
18. Ratio  
    Na:AlCl3  
    3:1  
    1:1/3  
    5:1.667  
    5 moles Na requires 1.667 moles AlCl3, but I have 5 moles so it is in excess and Na is limiting
19. 30g Na 🡪 moles = mass/Mr = 30/23 = 1.3  
    25g AlCl3 🡪 moles = mass/ Mr = 25/133.5 = 0.18  
    Na:AlCl3  
    3:1  
    1:1/3  
    1.3:0.43  
    I need 0.43 moles aluminium chloride, I have 0.18 so it is limiting
20. –
    1. Moles = mass/Mr = 90/23 = 3.9  
       3:1  
       1:1/3  
       3.9:1.3  
       Mass = moles x Mr = 1.3x27 = 35.1g
    2. 1.3 moles  
       Mass = moles x Mr = 1.3 x 133.5 = 173.55g
    3. 3.9 moles NaCl  
       mass = moles x Mr = 3.9 x 58.5 = 228.15g