

6 This question is about the Periodic Table.

(a) State the name given to Group VII elements.

..... [1]

(b) State which Group VII element is most reactive.

..... [1]

(c) Give the physical state and colour of iodine at room temperature and pressure.

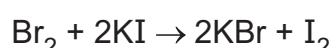
state .....

colour .....

[2]

(d) When bromine is added to aqueous potassium iodide a displacement reaction occurs.

The equation for the reaction is shown.

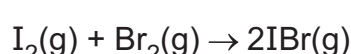


(i) Write an ionic equation for the reaction.

..... [2]

(ii) Iodine and bromine react at high temperatures to form iodine monobromide, IBr.

The equation is shown.



The structures of the molecules involved in the reaction are I–I, Br–Br and I–Br.

Table 6.1

bond	bond energy in kJ/mol
I–I	150
Br–Br	193
I–Br	175

Calculate the enthalpy change,  $\Delta H$ , for the reaction using the bond energies in Table 6.1.

Use the following steps.

- Calculate the **total** amount of energy required to break the bonds in 1 mol of  $\text{I}_2(\text{g})$  and 1 mol of  $\text{Br}_2(\text{g})$ .

..... kJ

- Calculate the total amount of energy released when the bonds in 2 mol of IBr(g) are formed.

..... kJ

- Calculate the enthalpy change,  $\Delta H$ , for the reaction. Your answer should include a sign.

..... kJ/mol [3]

(e) Sodium is in Group I of the Periodic Table.

When sodium is added to water a chemical reaction occurs.

(i) Give **two** observations when sodium is added to water.

1 .....

2 .....

[2]

(ii) Thymolphthalein is added to the solution when the reaction has finished.

State the final colour of the thymolphthalein in the solution.

..... [1]

[Total: 12]

The Periodic Table of Elements

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<tr><td>35</td><td>Br</td><td>bromine</td><td>80</td></tr> <tr><td>36</td><td>Kr</td><td>krypton</td><td>84</td></tr> <tr><td>37</td><td>Rb</td><td>rubidium</td><td>85</td></tr> <tr><td>38</td><td>Sr</td><td>strontium</td><td>88</td></tr> <tr><td>39</td><td>Y</td><td>yttrium</td><td>89</td></tr> <tr><td>40</td><td>Zr</td><td>zirconium</td><td>91</td></tr> <tr><td>41</td><td>Nb</td><td>niobium</td><td>93</td></tr> <tr><td>42</td><td>Mo</td><td>molybdenum</td><td>96</td></tr> <tr><td>43</td><td>Tc</td><td>technetium</td><td>—</td></tr> <tr><td>44</td><td>Ru</td><td>ruthenium</td><td>101</td></tr> <tr><td>45</td><td>Rh</td><td>rhenium</td><td>103</td></tr> <tr><td>46</td><td>Pd</td><td>palladium</td><td>106</td></tr> <tr><td>47</td><td>Ag</td><td>silver</td><td>108</td></tr> <tr><td>48</td><td>Cd</td><td>cadmium</td><td>112</td></tr> <tr><td>49</td><td>In</td><td>indium</td><td>115</td></tr> <tr><td>50</td><td>Sn</td><td>tin</td><td>119</td></tr> <tr><td>51</td><td>Sb</td><td>antimony</td><td>122</td></tr> <tr><td>52</td><td>Te</td><td>tellurium</td><td>128</td></tr> <tr><td>53</td><td>I</td><td>iodine</td><td>127</td></tr> <tr><td>54</td><td>Xe</td><td>xenon</td><td>131</td></tr> <tr><td>55</td><td>Cs</td><td>caesium</td><td>133</td></tr> <tr><td>56</td><td>Ba</td><td>barium</td><td>137</td></tr> <tr><td>57–71</td><td colspan="3">lanthanoids</td></tr> <tr><td>72</td><td>Hf</td><td>hafnium</td><td>178</td></tr> <tr><td>73</td><td>Ta</td><td>tantalum</td><td>181</td></tr> <tr><td>74</td><td>W</td><td>tungsten</td><td>184</td></tr> <tr><td>75</td><td>Re</td><td>rhenium</td><td>186</td></tr> <tr><td>76</td><td>Os</td><td>osmium</td><td>190</td></tr> <tr><td>77</td><td>Ir</td><td>iridium</td><td>192</td></tr> <tr><td>78</td><td>Pt</td><td>platinum</td><td>195</td></tr> <tr><td>79</td><td>Au</td><td>gold</td><td>197</td></tr> <tr><td>80</td><td>Hg</td><td>mercury</td><td>201</td></tr> 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The volume of one mole of any gas is 24 dm<sup>3</sup> at room temperature and pressure (r.t.p.).