

Name _____ Date _____

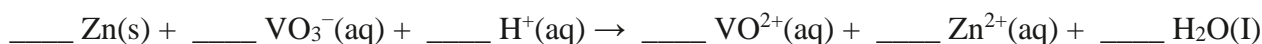
End of Chapter 20 test

This test and its sample answers have been written by the authors. IB may award marks differently.

1 In which substance does chlorine have the lowest oxidation number?

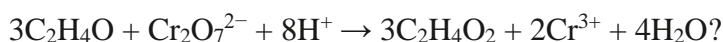
- A HClO_3
- B $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$
- C ClO_2^-
- D Cl_2

2 When the following redox equation is balanced using the smallest possible whole numbers, what is the sum of all the coefficients?



- A 10
- B 12
- C 16
- D 18

3 What is the oxidising agent in the following reaction?



- A H^+
- B $\text{C}_2\text{H}_4\text{O}$
- C $\text{C}_2\text{H}_4\text{O}_2$
- D $\text{Cr}_2\text{O}_7^{2-}$

4 Which one of the following is not a redox reaction?

- A $\text{I}_2 + 2\text{Na}_2\text{S}_2\text{O}_3 \rightarrow 2\text{NaI} + \text{Na}_2\text{S}_4\text{O}_6$
- B $\text{C}_3\text{H}_6 + \text{H}_2 \rightarrow \text{C}_3\text{H}_8$
- C $\text{Pb}(\text{NO}_3)_2 + 2\text{KI} \rightarrow \text{PbI}_2 + 2\text{KNO}_3$
- D $6\text{OH}^- + 3\text{Br}_2 \rightarrow 5\text{Br}^- + \text{BrO}_3^- + 3\text{H}_2\text{O}$

5 Which of the following changes requires a reducing agent?

- A $\text{Cl}^- \rightarrow \text{ClO}^-$
- B $\text{SO}_4^{2-} \rightarrow \text{SO}_3^{2-}$
- C $\text{H}_2\text{O}_2 \rightarrow \text{O}_2$
- D $\text{S}_2\text{O}_3^{2-} \rightarrow \text{S}_4\text{O}_6^{2-}$

Use the following table of standard reduction potentials to answer questions 6–11.

	E° / V
$\text{Na}^+(\text{aq}) + \text{e}^- \rightleftharpoons \text{Na}(\text{s})$	-2.71
$\text{Zn}^{2+}(\text{aq}) + 2\text{e}^- \rightleftharpoons \text{Zn}(\text{s})$	-0.76
$\text{Cr}^{3+}(\text{aq}) + 3\text{e}^- \rightleftharpoons \text{Cr}(\text{s})$	-0.74
$\text{Fe}^{2+}(\text{aq}) + 2\text{e}^- \rightleftharpoons \text{Fe}(\text{s})$	-0.45
$2\text{H}^+(\text{aq}) + 2\text{e}^- \rightleftharpoons \text{H}_2(\text{g})$	0.00
$\text{Cu}^{2+}(\text{aq}) + 2\text{e}^- \rightleftharpoons \text{Cu}(\text{s})$	+0.34
$\text{Cu}^+(\text{aq}) + \text{e}^- \rightleftharpoons \text{Cu}(\text{s})$	+0.52
$\text{I}_2(\text{aq}) + 2\text{e}^- \rightleftharpoons 2\text{I}^-(\text{aq})$	+0.54
$\text{Fe}^{3+}(\text{aq}) + \text{e}^- \rightleftharpoons \text{Fe}^{2+}(\text{s})$	+0.77
$\text{Ag}^+(\text{aq}) + \text{e}^- \rightleftharpoons \text{Ag}(\text{s})$	+0.80
$\text{Cl}_2(\text{aq}) + 2\text{e}^- \rightleftharpoons 2\text{Cl}^-(\text{aq})$	+1.36

6 Which species in the table is the strongest oxidising agent?

- A Cl_2
- B Na^+
- C Cl^-
- D Na

7 Which two species in the table can reduce Fe^{2+} to Fe?

- A Cr and H_2
- B Na and Zn
- C Cl^- and Ag
- D I^- and Cr

8 Which species in the table can oxidise Cu to Cu^{2+} but not Cl^- to Cl_2 ?

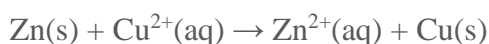
- A Cr^{3+}
- B Fe^{2+}
- C H^+
- D Fe^{3+}

9 What is the standard cell potential for the following equation?



- A +0.28 V
- B +0.46 V
- C +1.14 V
- D +1.26 V

10 For the following reaction, what is its ΔG^\ominus value?



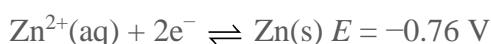
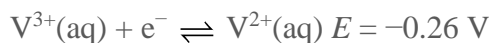
The value of the Faraday constant is $96\,500\text{ C mol}^{-1}$ and $\Delta G^\ominus = -nFE^\ominus$

- A -247 kJ mol^{-1}
- B -212 kJ mol^{-1}
- C -106 kJ mol^{-1}
- D $+106\text{ kJ mol}^{-1}$

11 In the voltaic cell $\text{Zn(s)}|\text{Zn}^{2+}(\text{aq})||\text{Fe}^{3+}(\text{aq}),\text{Fe}^{2+}(\text{aq})|\text{Pt(s)}$, which of the following is correct?

- A Zn^{2+} is reduced and Fe^{2+} is oxidised.
- B Electrons flow from the Zn/Zn^{2+} half-cell to the $\text{Fe}^{3+}/\text{Fe}^{2+}$ half-cell.
- C The half-cell $\text{Fe}^{3+}(\text{aq})/\text{Fe}^{2+}(\text{aq})$ is the anode of the voltaic cell.
- D Zn^{2+} is a stronger oxidizing agent than Fe^{3+} .

- 12** What is the vanadium species present in the reaction mixture when an excess of Zn powder is added to an acidified solution containing $\text{VO}_2^+(\text{aq})$ ions?



- A** $\text{V}^{2+}(\text{aq})$
 - B** $\text{V}^{3+}(\text{aq})$
 - C** $\text{VO}^{2+}(\text{aq})$
 - D** $\text{VO}_2^+(\text{aq})$
- 13** In the electrolysis of acidified water, which of the following statements is true?
- A** H_2 is produced at the anode and O_2 is produced at the cathode.
 - B** H_2 and O_2 are produced in a mole ratio of 1 : 2.
 - C** H_2 and O_2 are produced in a mole ratio of 1 : 1.
 - D** H_2 and O_2 are produced in a mole ratio of 2 : 1.
- 14** A spoon is being electroplated with silver. Which of the following statements are correct?
- I** The spoon should be the negative electrode.
 - II** Silver chloride is a suitable electrolyte for this process.
 - III** The anode is made of silver.
- A** III only
 - B** I and II only
 - C** I and III only
 - D** I, II and III

15 Butane-1,2-diol can be oxidised using acidified potassium dichromate(VI). Which of the following products could be formed?



A III only

B I and II only

C I and III only

D I, II and III

END OF TEST