

## Summary Quiz (Chapter 40)

### Section A: Multiple Choice

- Which of the following compounds is a white solid at room temperature?
  - $\text{CuSO}_4(\text{s})$
  - $\text{PbCrO}_4(\text{s})$
  - $\text{Fe}(\text{OH})_3(\text{s})$
  - $\text{MnO}_2(\text{s})$
- Chromium and cobalt are in the first transition series in the Periodic Table. Which of the following statements about chromium and cobalt is INCORRECT?
  - They conduct electricity at room temperature.
  - They are reducing agents.
  - They react vigorously with cold water to form hydrogen.
  - Their compounds are usually coloured.
- Which of the following metals forms more than one type of simple cations?
  - Lithium
  - Magnesium
  - Scandium
  - Vanadium
- Which of the following statements about copper is INCORRECT?
  - It is a reddish brown solid at room temperature.
  - It forms only one type of simple ion.
  - It reacts with concentrated sulphuric acid to give a blue solution.
  - It can be used to make electric cables.
- Which of the following transition metals is/are used as the catalyst in catalytic converters?
 

(1) Platinum                      (2) Vanadium                      (3) Rhodium

  - (1) only
  - (2) only
  - (1) and (3) only
  - (2) and (3) only
- Which of the following combinations about the colours of chromium-containing ions are correct?
 

	Chromium-containing ions	Colour
(1)	$\text{Cr}^{3+}(\text{aq})$	Green
(2)	$\text{CrO}_4^{2-}(\text{aq})$	Yellow
(3)	$\text{Cr}_2\text{O}_7^{2-}(\text{aq})$	Orange

  - (1) and (2) only
  - (1) and (3) only
  - (2) and (3) only
  - (1), (2) and (3)
- Which of the following combinations is INCORRECT?
 

	<u>Industrial and chemical process</u>	<u>Catalyst used</u>
A.	Decomposition of $\text{H}_2\text{O}_2$	$\text{MnO}_2$
B.	Manufacture of $\text{SO}_3$ from $\text{SO}_2$ and $\text{O}_2$	V
C.	Manufacture of $\text{NH}_3$ from $\text{N}_2$ and $\text{H}_2$	Fe
D.	Oxidation of $\text{I}^-$ (aq) by $\text{S}_2\text{O}_8^{2-}$ (aq)	$\text{Fe}^{3+}$

8. Which of the following transition metals is used to make stainless steel and zinc-carbon cells?
- A. Cr  
 B. Fe  
 C. Mn  
 D. Zn

### Section B: Structural Question

Manganese is a transition metal. The formulae and the colours of some manganese-containing species are shown below:

Formula	$\text{Mn}^{2+}(\text{aq})$	$\text{MnO}_2(\text{s})$	$\text{MnO}_4^{2-}(\text{aq})$	$\text{MnO}_4^{-}(\text{aq})$
Colour	Pale pink	Black	Green	Purple

- (a) Based on the above information, state TWO properties of a transition metal shown by manganese.
- (b) Manganate(VI) ion is only stable in alkaline medium. Otherwise, it will **disproportionate** into manganese(IV) oxide and manganate(VII) ion. Write a chemical equation for this reaction. **(Hints: Disproportionation = Self redox reaction)**
- (c) Manganate(VII) ion is unstable when exposed to light. Suggest how to store potassium permanganate solution in the school laboratory.
- (d) In acidic and alkaline media, manganate(VII) ion is reduced to different species.
- (i) Write the equations for the oxidations of iron(II) ion by potassium manganate(VII) in acidic and **alkaline / neutral media** respectively. **(Hints: Add  $\text{OH}^-$  in both sides of the ionic half equation in acidic media)**
- (ii) In which medium does manganate(VII) ion act as a stronger oxidizing agent?

**The End**

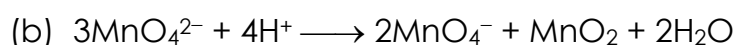
## Suggested Answer

### Section A

1.	A	5.	C
2.	C	6.	D
3.	D	7.	B
4.	B	8.	C

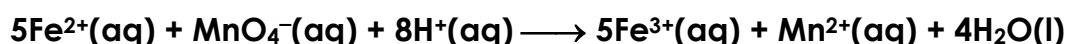
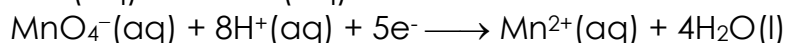
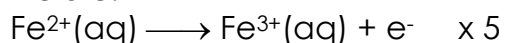
### Section B

(a) Many transition metals show variable oxidation states in their compounds. Many transition metal ions are coloured in aqueous solution.



(c) Store the solution in a brown bottle.

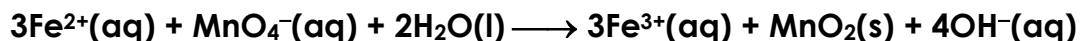
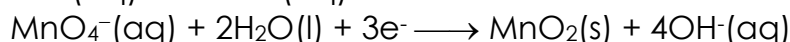
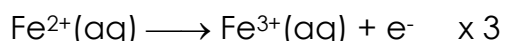
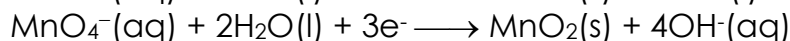
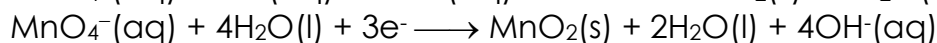
(d) (i) Acidic:



Alkaline / Neutral:



Add 4 OH<sup>-</sup>(aq) on both sides,



(ii) Acidic medium

(For the reduction in acidic medium, the change in oxidation number of manganese is larger.)

**The End**