WEIRD CHEMIST

d-Block Elements

Potassium Permanganate – SOLUTIONS

DPP – 08

Topic: $KMnO_4$ **Questions:** 41 Questions **Exam:** NEET / JEE

Quick Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	2	9	3	17	2	25	2	33	4
2	3	10	2	18	2	26	4	34	†
3	1	11	1	19	3	27	1	35	1
4	†	12	1	20	1	28	2	36	4
5	1	13	3	21	3	29	2	37	3
6	1	14	2	22	2	30	4	38	2
7	2	15	2	23	4	31	4	39	3
8	1	16	4	24	2	32	4	40	1
								41	4

† Q.4: my balanced equation gives products in 2:2:1:2 ratio, which matches none of the four listed options – see full note at the question. Q.34: no option I can verify with confidence – see full note at the question.

▶ TYPE 1 : Preparation of $KMnO_4$

[F] Master Formulae

The two-stage industrial route:

$$MnO_2 \xrightarrow[(air/O2)]{\text{fuse with KOH}} K_2MnO_4 \text{ (green)} \xrightarrow{\text{electrolytic oxidation}} KMnO_4 \text{ (purple)}$$

Note the second step is **oxidation**, not reduction – Mn goes from $+6$ (manganate) up to $+7$ (permanganate). In acid, manganate disproportionates back the other way:

$$3K_2MnO_4 + 2H_2SO_4 \rightarrow 2KMnO_4 + 2K_2SO_4 + MnO_2 + 2H_2O$$

Q1. Pyrolusite is used to prepare potassium permanganate:

$$MnO_2 \xrightarrow{X} MnO_4^{2-} \xrightarrow{Y} MnO_4^-$$

X and Y are

(1) Fuse with KOH/air, electrolytic reduction

(2) Fuse with KOH/air, electrolytic oxidation

(3) Fuse with conc. HNO_3/air, electrolytic reduction

(4) All are correct

[E] Explanation

X: fusing MnO_2 with KOH in air gives K_2MnO_4. Y: converting $MnO_4^{2-}(Mn^{6+})$ to $MnO_4^{-}(Mn^{7+})$ raises the oxidation state by one – that's electrolytic **oxidation**, not reduction.

[Ans] Answer

Option (2) Fuse with KOH/air, electrolytic oxidation.

Q2. $X + KOH + O_2 \rightarrow Y + H_2O$
$Y + H_2SO_4 \rightarrow Z + K_2SO_4 + MnO_2 + H_2O$
What are X, Y and Z in the above reactions?

(1) X = K_2MnO_4, Y = MnO_2, Z = $KMnO_4$

(2) X = K_2MnO_4, Y = MnO_4, Z = $KMnO_4$

(3) X = MnO_2, Y = K_2MnO_4, Z = $KMnO_4$

(4) X = MnO_2, Y = $KMnO_4 \cdot MnO_4$, Z = K_2MnO_4

[E] Explanation

The second line is exactly the manganate disproportionation (Master Formula) – so Y= K_2MnO_4, Z= $KMnO_4$. The first line (fusing with KOH+O_2 to give Y= K_2MnO_4) means X must be MnO_2, the starting pyrolusite ore.

[Ans] Answer

Option (3) X=MnO_2, Y=K_2MnO_4, Z=$KMnO_4$.

Q3. $K_2MnO_4 + H_2SO_4 \rightarrow KMnO_4 + K_2SO_4 + MnO_2 + H_2O$
What will be the mole ratio of reactants in the above (unbalanced) reaction?

(1) 3:2 (2) 2:1 (3) 1:2 (4) 2:2

[E] Explanation

Balancing: $3K_2MnO_4 + 2H_2SO_4 \rightarrow 2KMnO_4 + 2K_2SO_4 + MnO_2 + 2H_2O$. Reactant ratio K_2MnO_4:H_2SO_4 = 3:2.

[Ans] Answer

Option (1) 3:2.

Q4. $K_2MnO_4 + H_2SO_4 \rightarrow KMnO_4 + K_2SO_4 + MnO_2 + H_2O$
What will be the mole ratio of products in the above (unbalanced) reaction?

(1) 1:1:1:1 (2) 2:1:1:2 (3) 1:1:1:2 (4) 2:2:1:1

[E] Explanation

From the same balanced equation as Q.3: $KMnO_4$:K_2SO_4:MnO_2:$H_2O = 2 : 2 : 1 : 2$.

[!] Common Mistake

Flagging directly: I balanced this equation two independent ways (by inspection and algebraically) and both give products in the ratio **2:2:1:2** – which matches *none* of the four options exactly. Option (4), "2:2:1:1," is the closest (correct on the first three terms, off only on the water coefficient) and is almost certainly what was intended, with a likely typo turning the final "2" into a "1." I'm going with (4) as the best-supported choice, but the honest answer is that no listed option is fully correct.

[Ans] Answer

Option (4) 2:2:1:1 (closest match – my own balance gives 2:2:1:2; see note above).

Q5. What will be obtained when manganese dioxide is fused with KOH in presence of an oxidizing agent like KNO_3? What will be the colour of the product?

(1) K_2MnO_4, dark green (2) $KMnO_4$, Violet (3) Mn_2O_3, Grey (4) Mn_2O_4, Black

[Ans] Answer

Option (1) K_2MnO_4, dark green.

Q6. When MnO_2 is fused with KOH, a coloured compound is formed. The product is:–

(1) K_2MnO_4 (2) $KMnO_4$ (3) Mn_2O_3 (4) Mn_3O_4

[Ans] Answer

Option (1) K_2MnO_4.

Q7. Potassium manganate (K_2MnO_4) is formed when:–

(1) Cl_2 is passed into an aqueous $KMnO_4$ solution.

(2) MnO_2 is fused with KOH in air

(3) Formaldehyde reacts with $KMnO_4$ in presence of strong alkali.

(4) $KMnO_4$ reacts with concentrated H_2SO_4

[E] Explanation

This is the direct, standard industrial preparation of K_2MnO_4 (Master Formula). (1) doesn't fit – Cl_2 is itself an oxidiser, and Mn is already at its maximum +7 in $KMnO_4$, so there's no available oxidation for Cl_2 to drive. (4) gives explosive Mn_2O_7, not K_2MnO_4 (TYPE 5). (3) is chemically plausible in principle (a mild reducing agent in strong alkali can reduce permanganate one step to manganate) but is a much more niche fact than the standard fusion route.

[Ans] Answer

Option (2) MnO_2 is fused with KOH in air.

▶ TYPE 2 : Structure, Bonding & Colour

[F] Master Formulae

Manganate/permanganate are tetrahedral with all 4 Mn-O bonds equivalent (ideal $109°28'$ angle) thanks to p_π-d_π **bonding** – filled oxygen p-orbitals overlapping with empty manganese d-orbitals, delocalised equally across all four oxygens by resonance. Since Mn is $+7$ (d^0) in MnO_4^- and $+6$ (d^1) in MnO_4^{2-}, permanganate's intense colour is **charge transfer** (an electron jumping from O to the empty Mn d-orbitals, LMCT) rather than a true d-d transition – but manganate, having one genuine d-electron, gets both.

Q8. The manganate and permanganate ions are tetrahedral, due to [NEET-2019]

(1) The π-bonding involves overlap of p-orbitals of oxygen with d-orbitals of manganese

(2) There is no π-bonding

(3) The π-bonding involves overlap of p-orbitals of oxygen with p-orbitals of manganese

(4) The π-bonding involves overlap of d-orbitals of oxygen with d-orbitals of manganese

[Ans] Answer

Option (1) The π-bonding involves overlap of p-orbitals of oxygen with d-orbitals of manganese.

Q9. Which one of the following ions exhibits d-d transition and paramagnetism as well? [NEET-2018]

(1) CrO_4^{2-}

(2) $Cr_2O_7^{2-}$

(3) MnO_4^{2-}

(4) MnO_4^-

[E] Explanation

CrO_4^{2-} and $Cr_2O_7^{2-}$: Cr is $+6$, d^0 – no d-electrons, neither d-d transition nor paramagnetism possible. MnO_4^-: Mn is $+7$, also d^0 – same story. MnO_4^{2-}: Mn is $+6$, d^1 – genuinely has one unpaired d-electron, giving both a real d-d transition *and* paramagnetism.

[Ans] Answer

Option (3) MnO_4^{2-}.

Q10. MnO_4^- is of pale pink colour due to

(1) Charge transfer from metal to oxygen

(2) Charge transfer from oxygen to metal

(3) d-d transition

(4) All of these

[E] Explanation

Mn^{7+} is d^0 – no d-electrons, so d-d transition is impossible (ruling out 3 and 4). The colour comes from an electron transferring *from* an oxygen ligand *to* the empty manganese d-orbitals (ligand-to-metal charge transfer).

[Ans] Answer

Option (2) Charge transfer from oxygen to metal.

Q11. Assertion: MnO_4^- has a perfectly tetrahedral structure with bond angle of $109°28'$.
Reason: MnO_4^- has all four equal bonds due to resonance.

(1) Both Assertion and Reason are true, Reason gives correct explanation

(2) Both Assertion and Reason are true, it doesn't give correct explanation

(3) Assertion is correct but Reason is false

(4) Both Assertion and Reason are false

[E] Explanation

Both true, and directly linked: the resonance delocalisation that makes all four Mn-O bonds identical is *exactly why* the ion adopts the perfectly symmetric, ideal-angle tetrahedral geometry.

[Ans] Answer

Option (1)

Q12. Purple colour of $KMnO_4$ is due to:–

(1) Charge transfer spectra

(2) d-d transition

(3) Homo-Lumo transition

(4) None

[Ans] Answer

Option (1) Charge transfer spectra.

Q13. MnO_4^- is of intense pink colour, though Mn is in $(+7)$ oxidation state. It is due to.

(1) Oxygen gives colour to it

(2) Charge transfer when Mn gives its electron to oxygen

(3) Charge transfer when oxygen gives its electron to Mn, making it Mn(+VI) and hence coloured

(4) None is correct

[E] Explanation

Same LMCT mechanism as Q.10, spelled out in more detail: the electron transfer momentarily behaves as if Mn were reduced to a Mn(+VI)-like state during the transition – that transient shift is what produces the colour.

[Ans] Answer

Option (3) Charge transfer when oxygen gives its electron to Mn, making it Mn(+VI) and hence coloured.

▶ TYPE 3 : Behaviour of MnO_4^-/MnO_4^{2-} in Different Media & Disproportionation

[F] Master Formulae

$KMnO_4$'s reduction product depends entirely on the medium:

- **Acidic:** $Mn^{7+} \rightarrow Mn^{2+}$ (5-electron change) – the titration workhorse.
- **Neutral / faintly (dilute) alkaline:** $Mn^{7+} \rightarrow Mn^{4+}$ (MnO_2, 3-electron change). In this medium, iodide is oxidised all the way to **iodate** (IO_3^-).
- **Strongly alkaline:** $Mn^{7+} \rightarrow Mn^{6+}$ (MnO_4^{2-}/manganate, just 1-electron change).

Separately, manganate (MnO_4^{2-}) itself disproportionates in *acid*: $3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$ ($Mn^{6+} \rightarrow Mn^{7+}$ *and* Mn^{4+} simultaneously).

Q14. MnO_4^{2-} in acidic medium undergoes disproportionation to give [NCERT Pg. 231]

(1) Mn_2O_3 + MnO_4^-

(2) MnO_2 + MnO_4^-

(3) Mn_2O_7 + Mn_2O_3

(4) Mn_2O_7 + MnO_2

[Ans] Answer

Option (2) MnO_2 + MnO_4^-.

Q15. The change in the oxidation state of Mn from permanganate ion to the product obtained from its reaction in faintly alkaline medium is [NCERT Pg. 234]

(1) 2 (2) 3 (3) 4 (4) 5

[E] Explanation

Faintly alkaline medium takes $Mn^{7+} \rightarrow Mn^{4+}$ (MnO_2) – a change of 3 units.

[Ans] Answer

Option (2) 3.

Q16. When neutral or faintly alkaline $KMnO_4$ is treated with potassium iodide, iodide ion is converted into 'X'. 'X' is [NEET-2019 (Odisha)]

(1) IO^-
(2) I_2
(3) IO_4^-
(4) IO_3^-

[Ans] Answer

Option (4) IO_3^- (iodate).

Q17. In dilute alkaline solution, MnO_4^- changes to

(1) MnO_4^{2-} (2) MnO_2 (3) Mn_2O_3 (4) MnO

[E] Explanation

"Dilute" alkaline matches the "neutral/faintly alkaline" case (not the strongly-alkaline, single-electron case) – so the product is MnO_2, same as Q.15.

[!] Common Mistake

Don't lump every "alkaline" phrasing together – *strongly* alkaline stops at manganate (MnO_4^{2-}, 1-electron change), while *dilute/faintly* alkaline or neutral goes all the way to MnO_2 (3-electron change). The exact wording of "how alkaline" is the whole point of these questions.

[Ans] Answer

Option (2) MnO_2.

Q18. The product of I^- with MnO_4^- in alkaline medium is

(1) I_2 (2) IO_3^- (3) IO^- (4) IO_4^-

[Ans] Answer

Option (2) IO_3^-.

Q19. A purple coloured solution is made alkaline with KOH and is treated with KI, forming potassium iodate. The same solution is acidified with H_2SO_4 and again treated with KI. However this time, instead of potassium iodate, iodine gas is released. The purple coloured solution is of

(1) $K_2Cr_2O_7$ (2) K_2CrO_4 (3) $KMnO_4$ (4) K_2MnO_4

[E] Explanation

This exact dual behaviour – alkaline medium oxidising I^- to iodate, acidic medium oxidising I^- all the way to I_2 – is specifically $KMnO_4$'s signature (Q.16–18). Neither chromium compound shows this particular alkaline-vs-acidic iodide split, and the colour (purple, not orange) confirms it's not a chromate/dichromate species anyway.

[Ans] Answer

Option (3) $KMnO_4$.

Q20. Which of the following reactions are disproportionation reactions?

(a) $2Cu^+ \rightarrow Cu^{2+} + Cu$

(b) $3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$

(c) $2KMnO_4 \rightarrow K_2MnO_4 + MnO_2 + O_2$

(d) $2MnO_4^- + 3Mn^{2+} + 2H_2O \rightarrow 5MnO_2 + 4H^+$

(1) a, b (2) a, b, c (3) b, c, d (4) a, d

[E] Explanation

Disproportionation needs the *same* starting oxidation state splitting into both a higher *and* a lower state. (a): $Cu^+(+1)$ splits into $Cu^{2+}(+2$, up) and Cu(0, down) – genuine disproportionation. (b): Mn^{6+} splits into Mn^{7+}(up) and Mn^{4+}(down) – genuine disproportionation (this is the Master Formula reaction). (c): Mn^{7+} in $KMnO_4$ goes to Mn^{6+} *and* Mn^{4+} – both are *lower* than the start; nothing goes up, so this is just a reduction (with oxygen being oxidised instead), **not** disproportionation. (d): Mn^{7+}(down to $+4$) and Mn^{2+}(up to $+4$) converge to the *same* final state – this is the opposite pattern, called comproportionation, also **not** disproportionation.

[!] Common Mistake

(c) is a classic trap – it's a genuine redox decomposition, but Mn only ever goes *down* in oxidation state (to $+6$ and $+4$), never up, so it fails the disproportionation definition even though it "looks" similar to (b).

[Ans] Answer

Option (1) a, b.

Q21. When $KMnO_4$ reacts in slightly alkaline medium and acidic medium, the respective products obtained are:–

(1) K_2MnO_4 and Mn^{+2}

(2) MnO_2 and MnO_2

(3) MnO_2 and Mn^{+2}

(4) Mn^{+2} and MnO_2

[Ans] Answer

Option (3) MnO_2 and Mn^{+2}.

▶ TYPE 4 : Redox Reactions of $KMnO_4$ as an Oxidising Agent

[F] Master Formulae

n-factor of MnO_4^- tracks the medium exactly as in TYPE 3: **5** (acidic, $\rightarrow Mn^{2+}$), **3** (neutral/faintly alkaline, $\rightarrow MnO_2$), **1** (strongly alkaline, $\rightarrow MnO_4^{2-}$). Never acidify a permanganate titration with **HCl** – Cl^- gets oxidised to Cl_2, consuming reagent and corrupting the result; use **dilute H_2SO_4** instead.

Q22. Permanganate titrations in presence of hydrochloric acid are unsatisfactory since [NCERT Pg. 234]

(1) Hydrochloric acid is oxidised to hydrogen

(2) Hydrochloric acid is oxidised to chlorine

(3) Hydrochloric acid is highly volatile in nature

(4) Hydrochloric acid forms salt with permanganate ion

[Ans] Answer

Option (2) Hydrochloric acid is oxidised to chlorine.

Q23. n-factor of KI when treated with alkaline $KMnO_4$ solution is

(1) 2 (2) 3 (3) 5 (4) 6

[E] Explanation

In alkaline medium $I^- \rightarrow IO_3^-$: iodine goes from -1 to $+5$ (O is $-2 \times 3 = -6$, overall -1, so I$= +5$) – a 6-electron change.

[Ans] Answer

Option (4) 6.

Q24. The reaction of aqueous $KMnO_4$ with H_2O_2 in acidic conditions gives [AIPMT-2014]

(1) Mn^{4+} and O_2

(2) Mn^{2+} and O_2

(3) Mn^{2+} and O_3

(4) Mn^{4+} and MnO_2

[E] Explanation

Acidic medium takes $Mn^{7+} \rightarrow Mn^{2+}$ (n-factor 5), while H_2O_2 acts as the reducing agent, itself oxidised to O_2 gas.

[Ans] Answer

Option (2) Mn^{2+} and O_2.

Q25. Number of moles of MnO_4^- required to oxidize one mole of ferrous oxalate completely in acidic medium will be [AIPMT (Prelims)-2008]

(1) 0.2 moles
(2) 0.6 moles
(3) 0.4 moles
(4) 7.5 moles

[E] Explanation

Ferrous oxalate, FeC_2O_4, has *two* oxidisable parts: $Fe^{2+} \rightarrow Fe^{3+}$ (1 electron) and $C_2O_4^{2-} \rightarrow 2CO_2$ (2 electrons, each carbon $+3 \rightarrow +4$). Total n-factor of FeC_2O_4 = $1 + 2 = 3$. MnO_4^- in acid has n-factor 5. Equating equivalents: $1 \times 3 = x \times 5 \Rightarrow x = 0.6$.

[Ans] Answer

Option (2) 0.6 moles.

Q26. The number of moles of $KMnO_4$ that reduce one mole of KI in alkaline medium is [AIPMT (Prelims)-2005]

(1) One fifth
(2) Five
(3) One
(4) Two

[E] Explanation

n-factor of KI here is 6 (Q.23); n-factor of $KMnO_4$ in this alkaline (faintly alkaline/neutral) context is 3 (Q.15). Equating equivalents: $1 \times 6 = x \times 3 \Rightarrow x = 2$.

[Ans] Answer

Option (4) Two.

Q27. The equivalent weight of $MnSO_4$ is equal to its molecular weight when it is converted to

(1) Mn_2O_3
(2) MnO_2
(3) MnO_4^-
(4) MnO_4^{2-}

[E] Explanation

Equivalent weight = molecular weight only when n-factor = 1. $MnSO_4$ has Mn^{2+}. Check each target: Mn_2O_3(Mn^{3+}, change of 1 ✓); MnO_2(Mn^{4+}, change of 2); MnO_4^-(Mn^{7+}, change of 5); MnO_4^{2-}(Mn^{6+}, change of 4). Only Mn_2O_3 gives n-factor 1.

[Ans] Answer

Option (1) Mn_2O_3.

Q28. Which one of the following compounds does not decolourise an acidified aqueous solution of $KMnO_4$:–

(1) SO_2
(2) $FeCl_3$
(3) H_2O_2
(4) $FeSO_4$

[E] Explanation

Decolourising $KMnO_4$ requires a reducing agent. SO_2, H_2O_2, and $FeSO_4$ (Fe^{2+}) are all genuine reducing agents. $FeCl_3$ contains Fe^{3+} – already the *oxidised* product, with nothing left to give up to $KMnO_4$.

[Ans] Answer

Option (2) $FeCl_3$.

Q29. $KMnO_4$ is a strong oxidizing agent in acidic medium. To provide acidic medium, dil. H_2SO_4 is used, not HCl. This is due to:–

(1) H_2SO_4 is a stronger acid than HCl

(2) HCl is oxidised by $KMnO_4$ to Cl_2

(3) H_2SO_4 is a dibasic acid

(4) Rate of reaction is faster in presence of H_2SO_4

[Ans] Answer

Option (2) HCl is oxidised by $KMnO_4$ to Cl_2.

Q30. Acidified potassium permanganate is decolourised by:

(1) White vitriol (2) Bleaching powder (3) Laughing gas (4) Mohr's salt

[E] Explanation

White vitriol ($ZnSO_4$, Zn^{2+} already at its only common state) and laughing gas (N_2O, largely inert here) aren't reducing agents in this context; bleaching powder is itself an oxidiser. Mohr's salt ($FeSO_4 \cdot (NH_4)_2SO_4 \cdot {}_6H_2O$) supplies Fe^{2+} – the classic reducing agent, in fact the standard primary-standard reagent used specifically *for* permanganate titrations.

[Ans] Answer

Option (4) Mohr's salt.

▶ TYPE 5 : Thermal Decomposition & Reaction with Conc. Acid

[F] Master Formulae

Two completely different reactions, easy to mix up:

- **Simple heating:** $2KMnO_4 \xrightarrow{\Delta} K_2MnO_4 + MnO_2 + O_2$ – Mn ends up split between $+6$ and $+4$.
- **Cold, concentrated H_2SO_4:** $2KMnO_4 + 2H_2SO_4(\text{conc, cold}) \rightarrow Mn_2O_7 + 2KHSO_4 + H_2O$ – giving explosive Mn_2O_7 (Mn stays $+7$, an oily green liquid that can detonate on contact with organic matter). **Dilute** acid does *not* trigger this.

Q31. On heating $KMnO_4$, one among the following is not formed–

(1) K_2MnO_4 (2) O_2 (3) MnO_2 (4) MnO

[Ans] Answer

Option (4) MnO.

Q32. Which of the following products is not formed by heating $KMnO_4$

(1) K_2MnO_4 (2) MnO_2 (3) O_2 (4) Mn_2O_7

[E] Explanation

Mn_2O_7 specifically requires cold *concentrated* H_2SO_4 treatment (Q.35) – simple heating never produces it.

[Ans] Answer

Option (4) Mn_2O_7.

Q33. $KMnO_4$ is acidified by:–

(1) Conc. H_2SO_4 (2) dil. HCl (3) Conc. HNO_3 (4) dil. H_2SO_4

[E] Explanation

Dilute H_2SO_4 is the standard, safe acidifying agent – it avoids both HCl's Cl_2-forming side reaction (Q.22/29) and conc. H_2SO_4's explosive Mn_2O_7-forming reaction (Q.35).

[Ans] Answer

Option (4) dil. H_2SO_4.

Q34. The final products obtained for the following reaction are:

$$KMnO_4 \text{ (excess)} + \text{dil. } H_2SO_4$$

(1) Mn_2O_7 (2) MnO (3) Mn_3O_4 (4) MnO_3^+

[!] Common Mistake

Flagging honestly: I can rule out option (1) with confidence – Mn_2O_7 specifically needs *concentrated, cold* H_2SO_4 (Q.35), not dilute acid, so that reaction doesn't fire here. But I can't confidently verify any of the remaining three options (MnO, Mn_3O_4, or the unusual "MnO_3^+") as a well-established product of $KMnO_4$ simply sitting in dilute sulfuric acid with no separate reducing agent present – none of these match a standard reaction I can point to. This looks like it may be testing a fact from a specific source I don't have full visibility into, or the question may have an error. Please check this one against your official answer key rather than trusting my pick here.

[Ans] Answer

Not confidently resolved – Mn_2O_7 (option 1) is ruled out, but I can't verify which of the remaining three is intended. Please verify against your source.

Q35. A student accidentally added conc. H_2SO_4 to potassium permanganate and it exploded due to the formation of an explosive. Which of the following is formed?

(1) Mn_2O_7 (2) MnO_2 (3) Mn_2O_5 (4) Mn_2O_3

[Ans] Answer

Option (1) Mn_2O_7 (a green, oily, highly unstable liquid that can detonate on contact with organic matter).

▶ TYPE 6 : General Properties & Uses

Q36. Which of the following characteristic properties of $KMnO_4$ is/are correct?

(1) $KMnO_4$ forms dark purple crystals

(2) SO_2 is oxidised to SO_4^{2-} with $KMnO_4$ in acidic medium

(3) Purple colour of MnO_4^- ion is due to charge transfer

(4) All of these

[E] Explanation

All three are established facts from this DPP – dark purple/near-black crystalline solid; SO_2 decolourises acidic $KMnO_4$ by being oxidised to sulfate (TYPE 4); charge-transfer colour (TYPE 2).

[Ans] Answer

Option (4) All of these.

Q37. Statement-A: In the $3d$-series, the m.p. of Mn is low.
Statement-B: Electronic configuration of Mn is $[Ar]\,3d^5\,4s^2$.
Statement-C: Highest O.S. of Mn is $+6$.
Statement-D: $KMnO_4$ is colourless.
Which of the following are correct?

(1) A, B, C (3) A, B

(2) B, C (4) B, C, D

[E] Explanation

A is true – Mn shows a genuine dip/anomaly in the 3d melting-point trend (DPP-02), notably lower than both neighbours. B is true (standard configuration). C is false – Mn's highest oxidation state is $+7$ ($KMnO_4$ itself!), not $+6$. D is false – $KMnO_4$ is famously intensely purple, the entire subject of this DPP.

[Ans] Answer

Option (3) A, B.

Q38. Which of the following is used in dry cell?

(1) $KMnO_4$ (2) MnO_2 (3) $K_2Cr_2O_7$ (4) K_2MnO_2

[E] Explanation

MnO_2 is the classic depolariser in the Leclanché dry cell.

[Ans] Answer

Option (2) MnO_2.

Q39. Potassium permanganate is used as.....

(1) As reducing agent
(2) As corrosion inhibitor
(3) As strong oxidant
(4) In preparation of azo compounds

[Ans] Answer

Option (3) As strong oxidant.

Q40. Anhydride of permanganic acid $HMnO_4$ is:–

(1) Mn_2O_7 (2) MnO_2 (3) Mn_2O_3 (4) MnO

[E] Explanation

$Mn_2O_7 + H_2O \rightarrow 2HMnO_4$ – Mn^{7+} in both, matching oxidation states as required for a genuine acid anhydride.

[Ans] Answer

Option (1) Mn_2O_7.

Q41. Which of the following is a use of potassium permanganate?

(1) Bleaching of wool, cotton and silk fibres
(2) Decolourisation of oils
(3) In analytical chemistry
(4) All of these

[E] Explanation

All three are genuine, standard real-world applications of $KMnO_4$'s oxidising power.

[Ans] Answer

Option (4) All of these.

$KMnO_4$'s whole story is Mn(VII) looking for the easiest way down – and the medium decides exactly how far it falls.

– Your Weird Chemist