WC

WEIRD CHEMIST

d-Block Elements

Potassium Dichromate – SOLUTIONS

DPP – 07

Topic: $K_2Cr_2O_7$ **Questions:** 45 Questions **Exam:** NEET / JEE

Quick Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	2	10	2	19	3	28	1*	37	2
2	4	11	2	20	3*	29	2	38	1
3	2	12	3	21	3	30	2	39	1*
4	3	13	1	22	3*	31	1	40	3
5	1	14	1†	23	4	32	1*	41	4
6	3	15	3	24	4	33	3	42	4
7	3	16	3	25	1	34	1	43	1
8	1	17	1†	26	2	35	2	44	1
9	1	18	4	27	3	36	3	45	1

**Q.20,22 repeat Q.15; Q.28 repeats Q.26; Q.32 repeats Q.27; Q.39 repeats Q.35 – flagged in your source, solved once each.*

† Q.14 and Q.17 test the identical pH-interconversion fact but your source gives different specific values for each – see the note at both questions.

▶ TYPE 1 : Preparation from Chromite Ore

[F] Master Formulae

The industrial route, in one balanced equation:

$$4FeCr_2O_4 + 8Na_2CO_3 + 7O_2 \xrightarrow{\Delta} 8Na_2CrO_4 + 2Fe_2O_3 + 8CO_2$$

This roasting step gives **yellow sodium chromate** – dichromate only appears *later*, after acidification.

Q1. The coloured product obtained on reaction of ferrous chromate with sodium carbonate in free access of air is [NCERT Pg. 231]

(1) Purple solution of ferric dichromate

(2) Yellow solution of sodium chromate

(3) Green solution of sodium dichromate

(4) Brownish solution of ferrous oxide

[E] Explanation

Roasting chromite ore ($FeCr_2O_4$) with Na_2CO_3 in air gives **Na_2CrO_4**, sodium chromate – yellow. Dichromate (orange) doesn't appear until this is subsequently acidified (Q.2 onward).

[Ans] Answer

Option (2) Yellow solution of sodium chromate.

Q2. Chromite ore $\xrightarrow{Na_2CO_3+O_2}$ A $\xrightarrow[NaOH]{H_2SO_4}$ B
The anions present in products A and B is/are

(1) A = $Cr_2O_4^{2-}$

(2) B = $Cr_2O_7^{2-}$

(3) A = CrO_4^{2-}

(4) Both (2) & (3)

[E] Explanation

A = Na_2CrO_4, anion = CrO_4^{2-} (option 1's "$Cr_2O_4^{2-}$" isn't even a real chromate formula). Acidifying A with H_2SO_4 gives B = $Na_2Cr_2O_7$, anion = $Cr_2O_7^{2-}$. Both (2) and (3) are correct.

[Ans] Answer

Option (4) Both (2) & (3).

Q3. $FeCr_2O_4$ + Na_2CO_3 + $O_2 \rightarrow$? Which product is obtained?

(1) Na_2CrO_4 + Fe_3O_4 + CO_2

(2) Na_2CrO_4 + Fe_2O_3 + CO_2

(3) $Na_2Cr_2O_7$ + Fe_2O_3 + CO_2

(4) $Na_2Cr_2O_7$ + Fe_2O_3 + CO

[E] Explanation

Direct from the Master Formula equation – this roasting step gives chromate (not dichromate yet) and Fe_2O_3 (not Fe_3O_4).

[Ans] Answer

Option (2) Na_2CrO_4 + Fe_2O_3 + CO_2.

Q4. What will be the mole ratio of reactants in the following (unbalanced) reaction?
$FeCr_2O_4$ + Na_2CO_3 + $O_2 \rightarrow$ Na_2CrO_4 + Fe_2O_3 + CO_2

(1) 2:4:7 (2) 4:6:6 (3) 4:8:7 (4) 4:8:4

[E] Explanation

Balancing (matching Fe, Cr, Na, C, then O last): $4FeCr_2O_4 + 8Na_2CO_3 + 7O_2 \rightarrow 8Na_2CrO_4 + 2Fe_2O_3 + 8CO_2$. Reactant ratio $FeCr_2O_4$:Na_2CO_3:O_2 = 4:8:7.

[Ans] Answer

Option (3) 4:8:7.

Q5. What will be the mole ratio of products in the following (unbalanced) equation?
$FeCr_2O_4 + Na_2CO_3 + O_2 \rightarrow Na_2CrO_4 + Fe_2O_3 + CO_2$

(1) 8:2:8 (2) 8:4:8 (3) 4:4:8 (4) 8:2:6

[E] Explanation

From the same balanced equation as Q.4: Na_2CrO_4:Fe_2O_3:CO_2 = 8:2:8.

[Ans] Answer

Option (1) 8:2:8.

Q6. $FeCr_2O_4 + Na_2CO_3 + O_2 \rightarrow X + Y + CO_2$
Mention X and Y

(1) X = $Na_2Cr_2O_7$, Y = Fe_3O_4
(2) X = Na_2CrO_4, Y = Fe_3O_4
(3) X = Na_2CrO_4, Y = Fe_2O_3
(4) X = $Na_2Cr_2O_7$, Y = Fe_2O_3

[Ans] Answer

Option (3) X=Na_2CrO_4, Y=Fe_2O_3.

▶ TYPE 2 : Structure & Bonding

[F] Master Formulae

Dichromate is two CrO_4 tetrahedra sharing one corner oxygen – a **Cr-O-Cr bridge** (bond angle $\approx 126°$), with **no direct Cr-Cr bond** and **no O-O bond** anywhere. Each Cr keeps 3 "terminal" oxygens; all **6 terminal Cr-O bonds** (3 per Cr $\times$ 2) are equivalent to each other, while the 2 Cr-O bonds to the shared bridging oxygen are different from those six.

Q7. In the dichromate ion [NCERT Pg. 232]

(1) All eight Cr–O bonds are equivalent and have a Cr–O–Cr bond
(2) Six Cr–O bonds are equivalent and have a Cr–Cr bond

(3) Six Cr–O bonds are equivalent and have a Cr–O–Cr bond

(4) Four Cr–O bonds are equivalent and have a Cr–Cr bond

[Ans] Answer

Option (3) Six Cr–O bonds are equivalent and have a Cr–O–Cr bond.

Q8. (Cr–O–Cr) bond angle in $Cr_2O_7^{2-}$ is nearly

(1) 126° (2) 105.5° (3) 150° (4) 97°

[Ans] Answer

Option (1) 126°.

Q9. Which is the correct statement about $Cr_2O_7^{2-}$ structure?

(1) It has neither a Cr–Cr bond nor an O–O bond

(2) It has one Cr–Cr bond and six O–O bonds

(3) It has no Cr–Cr bond but has six O–O bonds

(4) It has one Cr–Cr bond and seven Cr–O bonds

[E] Explanation

The two CrO_4 tetrahedra are joined *only* through the bridging oxygen (Cr-O-Cr) – there's no direct metal-metal bond, and oxygens never bond to each other in this structure.

[Ans] Answer

Option (1) It has neither a Cr–Cr bond nor an O–O bond.

Q10. In the dichromate dianion:

(1) 4 Cr–O bonds are equivalent

(2) 6 Cr–O bonds are equivalent

(3) All Cr–O bonds are equivalent

(4) All Cr–O bonds are non-equivalent

[Ans] Answer

Option (2) 6 Cr–O bonds are equivalent.

▶ TYPE 3 : Colour & Charge Transfer

[F] Master Formulae

Cr in CrO_3, CrO_4^{2-}, and $Cr_2O_7^{2-}$ is all $+6$, i.e. d^0 – **no d-electrons at all**, so none of these can be coloured via d-d transition. Their vivid colour instead comes from **charge transfer** (an electron

jumping from an oxygen ligand orbital to an empty metal orbital). Ions with genuine partially-filled d-subshells (like Fe^{2+}, d^6) get their colour the "ordinary" way, via real d-d transitions.

Q11. The colour of $K_2Cr_2O_7$ and Fe^{2+} ions are respectively due to

(1) d-d transition and charge transfer spectra
(2) Charge transfer spectra and d-d transition
(3) Crystal defects and charge transfer spectra
(4) Charge transfer spectra and crystal defects

[E] Explanation

$K_2Cr_2O_7$: Cr^{6+} is d^0 – colour must be charge transfer. Fe^{2+}: d^6, has real unpaired d-electrons – genuine d-d transition.

[Ans] Answer

Option (2) Charge transfer spectra and d-d transition.

Q12. CrO_3 is coloured due to

(1) Crystal defect (2) Unpaired electrons (3) Charge transfer spectra (4) Low I.E.

[Ans] Answer

Option (3) Charge transfer spectra.

▶ TYPE 4 : Chromate–Dichromate Equilibrium & pH-Dependent Interconversion

[F] Master Formulae

$$2CrO_4^{2-}\ (\text{yellow}) + 2H^+ \rightleftharpoons Cr_2O_7^{2-}\ (\text{orange}) + H_2O$$

Acidic medium pushes this right (toward orange dichromate); **basic medium pushes it left** (toward yellow chromate). Critically, this is a **condensation/dimerisation**, not a redox reaction – Cr stays $+6$ throughout. The interconversion is often described as a monocentric (single-Cr, CrO_4^{2-}) species turning into a dicentric (two-Cr, bridged) species, and back.

Q13. The equilibrium $2CrO_4^{2-} \rightleftharpoons Cr_2O_7^{2-}$ shifts to the right in [NCERT Pg. 232]

(1) Acidic medium
(2) Basic medium
(3) Neutral medium
(4) Faintly alkaline medium

[Ans] Answer

Option (1) Acidic medium.

Q14. $Cr_2O_7^{2-} \underset{pH=Y}{\overset{pH=X}{\rightleftharpoons}} CrO_4^{2-}$

The values of Y and X respectively are

This numeric pH pair differs from the one given as correct in Q.17 – both test the same chromate/dichromate pH-interconversion fact but the two sources disagree on the exact value. Worth checking against your reference.

(1) 3, 8 (2) 8, 4 (3) 8, 10 (4) 10, 2

[E] Explanation

Reading the labels literally: X sits over the forward arrow (dichromate $\rightarrow$ chromate), so X should be a **basic/higher** pH; Y sits under the reverse arrow (chromate $\rightarrow$ dichromate), so Y should be an **acidic/lower** pH. That means we need $Y < X$. Only options (1) and (3) satisfy this direction; between them, $Y = 3$ (option 1) is genuinely acidic and fits "favours dichromate" far better than $Y = 8$ (option 3, which is itself mildly basic and contradicts its own role).

[!] Common Mistake

Flagging the cross-question conflict directly: this question's own logic points to $Y = 3, X = 8$, while Q.17 (same fact, asked more plainly) points to a lower acidic threshold of 6 rather than 3. Both agree that acidic $\rightarrow$ dichromate and $\approx$pH 8 $\rightarrow$ chromate – they only disagree on exactly *how* acidic "acidic" needs to be. I'd trust whichever specific number your own reference source/answer key uses; the qualitative direction is solid either way.

[Ans] Answer

Option (1) 3, 8 (i.e. Y= 3, X= 8) – see note above.

Q15. The yellow colour of chromates changes to orange on acidification due to formation of

(1) Cr^{3+} (2) Cr_2O_3 (3) $Cr_2O_7^{2-}$ (4) CrO_4^-

[Ans] Answer

Option (3) $Cr_2O_7^{2-}$.

Q16. When dil. H_2SO_4 is added to an aqueous solution of potassium chromate, the yellow colour of the solution turns to orange colour. It indicates

(1) Chromate ions are reduced

(2) Chromate ions are oxidised

(3) Monocentric complex is converted into dicentric complex

(4) Oxygen gets removed from chromate ions

[E] Explanation

Cr stays $+6$ the whole time – this is *not* a redox change at all, ruling out both "reduced" and "oxidised." What actually happens is two separate single-Cr (monocentric) CrO_4^{2-} units condensing into one bridged, two-Cr (dicentric) $Cr_2O_7^{2-}$ unit.

[Ans] Answer

Option (3) Monocentric complex is converted into dicentric complex.

Q17. CrO_4^{2-} (yellow) changes to $Cr_2O_7^{2-}$ (orange) at pH $= x$ and vice-versa at pH $= y$. Hence, x and y are

Compare with Q.14 – the two questions test the same interconversion but again disagree on the specific pH values.

(1) 6, 8 (2) 6, 5 (3) 8, 6 (4) 7, 7

[E] Explanation

x = pH at which chromate turns *into* dichromate (acidification, so x should be the lower/acidic value); y = pH for the reverse, dichromate back to chromate (basification, so y should be higher). We need $x < y$: only option (1), "6, 8," satisfies that direction (the other three either reverse it or give an uninformative tie).

[!] Common Mistake

As flagged at Q.14: this question's acidic threshold ($x = 6$) doesn't match Q.14's implied threshold (≈ 3) for the same physical fact. Take the direction (acidic $\rightarrow$ dichromate, $\approx$pH 8 $\rightarrow$ chromate) as solid, and check your specific reference for which exact acidic cutoff it wants.

[Ans] Answer

Option (1) 6, 8 – see note above.

Q18. What are the species X and Y in the following?

$X + H_2O \rightarrow H_2Cr_2O_7 \xrightarrow{OH^-} Y$

(1) CrO_4^{2-}, $Cr_2O_7^{2-}$
(2) CrO_3, Cr_2O_3
(3) H_2CrO_4, $H_2Cr_2O_7$
(4) CrO_3, CrO_4^{2-}

[E] Explanation

$2CrO_3 + H_2O \rightarrow H_2Cr_2O_7$ (dichromic acid forms directly from chromium trioxide plus water) $\Rightarrow$ X= CrO_3. Adding OH^- (base) to dichromic acid shifts the equilibrium toward the base-favoured chromate ion $\Rightarrow$ Y= CrO_4^{2-}.

[Ans] Answer

Option (4) CrO_3, CrO_4^{2-}.

Q19. $X + H^+ \rightarrow Y + Na^+ + H_2O$
$Y + KCl \rightarrow K_2Cr_2O_7 + NaCl$
Mention X and Y

Formula subscripts standardised from the scanned copy (garbled as "Na_2Cr,O_7"-style notation) to consistent Na_2CrO_4 / $Na_2Cr_2O_7$ formulas.

(1) X = $Na_2Cr_2O_7$, Y = Na_2CrO_4

(2) X = $Na_2Cr_2O_7$, Y = $Na_2Cr_2O_7$

(3) X = Na_2CrO_4, Y = $Na_2Cr_2O_7$

(4) X = Na_2CrO_4, Y = Na_2CrO_4

[E] Explanation

Second line: Y must already be $Na_2Cr_2O_7$, since it swaps its Na for K (a simple metathesis) to give $K_2Cr_2O_7$ + NaCl. First line: acidifying Na_2CrO_4 (X) converts it to $Na_2Cr_2O_7$ (Y), releasing free Na^+ and water – exactly the established chromate→dichromate acidification.

[Ans] Answer

Option (3) X=Na_2CrO_4, Y=$Na_2Cr_2O_7$.

Q20. The yellow colour of chromates changes to orange on acidification due to formation of.

Same as Q.15.

(1) Cr^{3+} (2) Cr_2O_3 (3) $Cr_2O_7^{2-}$ (4) CrO_4

[Ans] Answer

Option (3) $Cr_2O_7^{2-}$ – see Q.15.

Q21. The yellow colour solution of Na_2CrO_4 changes to orange red on passing CO_2 gas due to the formation of:–

(1) CrO_5 (2) CrO_3 (3) $Na_2Cr_2O_7$ (4) Cr_2O_3

[E] Explanation

CO_2 dissolves in water to form mildly acidic carbonic acid (H_2CO_3) – just enough acidification to push the equilibrium toward $Na_2Cr_2O_7$, without needing a strong mineral acid.

[Ans] Answer

Option (3) $Na_2Cr_2O_7$.

Q22. The yellow colour of chromates changes to orange on acidification due to formation of:

Same as Q.15 and Q.20.

(1) Cr^{3+} (2) Cr_2O_3 (3) $Cr_2O_7^{2-}$ (4) CrO_4^-

[Ans] Answer

Option (3) $Cr_2O_7^{2-}$ – see Q.15.

▶ TYPE 5 : Chromyl Chloride Test

[F] Master Formulae

The chromyl chloride test: warming a chloride salt with $K_2Cr_2O_7$ and conc. H_2SO_4 produces **deep red CrO_2Cl_2 vapour** – a positive test for chloride. It **fails** for chlorides that don't readily release free Cl^- under these conditions: $PbCl_2$, AgCl (both too insoluble) and $HgCl_2$ (too covalent/weakly ionising).

Q23. Chromyl chloride test is not given by

(1) $HgCl_2$ (2) $PbCl_2$ (3) AgCl (4) All of these

[Ans] Answer

Option (4) All of these.

Q24. Which of the following statement(s) is/are correct when a mixture of NaCl and $K_2Cr_2O_7$ is gently warmed with conc. H_2SO_4?

(1) A deep red vapour is evolved

(2) Chromyl chloride is formed

(3) Chlorine gas is evolved

(4) Both (1) & (2)

[E] Explanation

NaCl is a simple, freely-ionising chloride – it gives a textbook-positive chromyl chloride test: the deep red vapour observed *is* CrO_2Cl_2 itself, not Cl_2 gas.

[Ans] Answer

Option (4) Both (1) & (2).

Q25. Which of the following gives the chromyl chloride test:–

(1) KCl (2) $PbCl_2$ (3) $HgCl_2$ (4) All

[Ans] Answer

Option (1) KCl (a simple, soluble, freely-ionising chloride).

▶ TYPE 6 : Reaction with H_2O_2 (Perchromic Acid / CrO_5 Blue Test)

[F] Master Formulae

Acidified dichromate/chromic acid + H_2O_2 gives **deep blue CrO_5** (chromium peroxide/perchromic acid), best seen extracted into ether/amyl alcohol. **The classic trap:** despite the dramatic colour change, Cr's oxidation state stays exactly $+6$ in CrO_5 – the peroxide ($-O-O^-$) linkages absorb the "extra" oxidising character, not the chromium itself.

Q26. When H_2O_2 is added to acidified $K_2Cr_2O_7$, in ether a blue colour is formed due to the formation of

(1) CrO_3 (2) CrO_5 (3) Cr_2O_3 (4) CrO

[Ans] Answer

Option (2) CrO_5.

Q27. Acidified solution of chromic acid on treatment with H_2O_2 gives blue colour which is due to

(1) $CrO_3 + H_2O + O_2$

(2) $Cr_2O_3 + H_2O + O_2$

(3) $CrO_5 + H_2O$

(4) $H_2Cr_2O_7 + H_2O + CO_2$

[Ans] Answer

Option (3) $CrO_5 + H_2O$.

Q28. The blue colour produced on adding H_2O_2 to acidified $K_2Cr_2O_7$ is due to the formation of

Same as Q.26.

(1) CrO_5 (2) Cr_2O_3 (3) CrO_4^{2-} (4) CrO_3

[Ans] Answer

Option (1) CrO_5 – see Q.26.

Q29. $K_2Cr_2O_7 + H_2SO_4 + 4H_2O_2 \rightarrow K_2SO_4 + 5H_2O + A$
Product (A) is.

(1) Cr_2O_3 (2) CrO_5 (3) CrO (4) CrO_3

[E] Explanation

Checking oxygen balance confirms it: LHS O $= 7(Cr_2O_7^{2-}) + 4(SO_4^{2-}) + 4 \times 2(H_2O_2) = 19$; RHS O (excluding A) $= 4(K_2SO_4) + 5(H_2O) = 9$, leaving 10 O for A – exactly $2 \times CrO_5$ (5 O each, matching the 2 Cr atoms from dichromate).

[Ans] Answer

Option (2) CrO_5.

Q30. What change does not occur when $K_2Cr_2O_7$ reacts with H_2O_2 solution:–

(1) Orange colour of solution turns blue
(2) Oxidation state of Cr atom decreases
(3) O.S. of Cr atom remains constant
(4) None of these

[E] Explanation

This is the classic CrO_5 trap (Master Formula): Cr is $+6$ in $Cr_2O_7^{2-}$ and *still* $+6$ in CrO_5 – the peroxide oxygens carry the redox change, not chromium. So Cr's oxidation state does **not** decrease; that's the change that fails to occur.

[Ans] Answer

Option (2) Oxidation state of Cr atom decreases – this does NOT occur.

Q31. $K_2Cr_2O_7$ on reaction with H_2O_2 gives a blue coloured compound in which the oxidation state of the metal is:–

(1) $+6$ (2) $+3$ (3) $+2$ (4) $+4$

[Ans] Answer

Option (1) $+6$.

Q32. Acidified chromic acid $+ H_2O_2 \xrightarrow{\text{Organic solvent}}$ X + Y (Blue)
X and Y are:–

Same as Q.27.

(1) CrO_5 and H_2O (2) Cr_2O_3 and H_2O (3) CrO_2 and H_2O (4) CrO and H_2O

[Ans] Answer

Option (1) CrO_5 and H_2O – see Q.27.

▶ TYPE 7 : Redox Reactions & Thermal Decomposition (Oxidising Agent)

[F] Master Formulae

Acidic-medium reduction half-reaction: $Cr_2O_7^{2-} + 14H^+ + 6e^- \rightarrow 2Cr^{3+} + 7H_2O$ – **6 electrons transferred**, so equivalent weight $= M/6$. $Cr_2O_7^{2-}$ (orange) oxidises SO_2, sulfite, Fe^{2+}, Sn^{2+}, and H_2S, always ending up as **green Cr^{3+}**. Thermal decomposition: $4K_2Cr_2O_7 \xrightarrow{\Delta} 4K_2CrO_4 + 2Cr_2O_3 + 3O_2$.

Q33. Equivalent weight of $K_2Cr_2O_7$ in acidic medium is equal to

(1) $M/2$ (2) $M/5$ (3) $M/6$ (4) $M/8$

[E] Explanation

Each Cr goes from $+6 \rightarrow +3$ (a 3-electron change) and there are 2 Cr atoms per formula unit, giving 6 electrons transferred overall.

[Ans] Answer

Option (3) $M/6$.

Q34. Which one of the following statements is correct when SO_2 is passed through acidified $K_2Cr_2O_7$ solution? [NEET-2016]

(1) Green $Cr_2(SO_4)_3$ is formed

(2) The solution turns blue

(3) The solution is decolourised

(4) SO_2 is reduced

[E] Explanation

SO_2 is the reducing agent here (it gets *oxidised* to sulfate, not reduced – ruling out option 4), reducing $Cr_2O_7^{2-}$ to green Cr^{3+}, which combines with the sulfate produced to give green $Cr_2(SO_4)_3$. No blue colour (that's the separate H_2O_2/CrO_5 story) and the solution turns green, not colourless.

[Ans] Answer

Option (1) Green $Cr_2(SO_4)_3$ is formed.

Q35. Acidified $K_2Cr_2O_7$ solution turns green when Na_2SO_3 is added to it. This is due to the formation of [AIPMT (Prelims)-2011]

(1) $CrSO_4$ (2) $Cr_2(SO_4)_3$ (3) CrO_4^{2-} (4) $Cr_2(SO_3)_3$

[E] Explanation

Same mechanism as Q.34: sulfite reduces dichromate to green Cr^{3+}, itself being oxidised to sulfate – giving $Cr_2(SO_4)_3$.

[Ans] Answer

Option (2) $Cr_2(SO_4)_3$.

Q36. $4K_2Cr_2O_7 \xrightarrow{\Delta} 4K_2CrO4 + 3O_2 + X$**, in this reaction X is**

(1) CrO_3 (2) Cr_2O_7 (3) Cr_2O_3 (4) CrO_5

[E] Explanation

Balancing Cr and O: LHS has 8 Cr and 28 O; RHS (before X) has 4 Cr (in K_2CrO_4) and $16+6 = 22$ O. X must supply the remaining 4 Cr and 6 O – exactly $2 \times Cr_2O_3$.

[Ans] Answer

Option (3) Cr_2O_3.

Q37. Ammonium dichromate is used in fireworks. The green coloured powder blown into the air is

(1) CrO_3 (2) Cr_2O_3 (3) Cr (4) $CrO(O)_2$

[E] Explanation

The classic "volcano" demonstration: $(NH_4)_2Cr_2O_7$ decomposes on ignition into N_2 gas, H_2O vapour, and a green Cr_2O_3 ash that's thrown into the air, mimicking volcanic ash.

[Ans] Answer

Option (2) Cr_2O_3.

Q38. When an acidified solution of $K_2Cr_2O_7$ is shaken with an aqueous solution of $FeSO_4$ then.

(1) $Cr_2O_7^{2-}$ ion is reduced to Cr^{3+} ions

(2) $Cr_2O_7^{2-}$ ion is converted to CrO_4^{2-} ions

(3) $Cr_2O_7^{2-}$ ion is reduced to Cr

(4) $Cr_2O_7^{2-}$ ion is converted to CrO_3

[E] Explanation

Fe^{2+} is the reducing agent (oxidised to Fe^{3+}) – exactly the basis of dichromate redox titrations for estimating Fe^{2+}.

[Ans] Answer

Option (1) $Cr_2O_7^{2-}$ ion is reduced to Cr^{3+} ions.

Q39. Acidified $K_2Cr_2O_7$ solution turns green when Na_2SO_3 is added to it. This is due to the formation of.

Same as Q.35.

(1) $Cr_2(SO_4)_3$ (2) CrO_4^{2-} (3) $Cr_2(SO_3)_3$ (4) $CrSO_4$

[Ans] Answer

Option (1) $Cr_2(SO_4)_3$ – see Q.35.

Q40. When acidified $K_2Cr_2O_7$ solution is added to Sn^{2+} salts then Sn^{2+} changes to:–

(1) Sn (2) Sn^{3+} (3) Sn^{4+} (4) Sn^{+}

[E] Explanation

Sn^{2+} is a reducing agent, readily oxidised to its other accessible state, Sn^{4+} (there's no stable Sn^{3+} or Sn^{+}), while $Cr_2O_7^{2-}$ is reduced to Cr^{3+}.

[Ans] Answer

Option (3) Sn^{4+}.

▶ TYPE 8 : General Properties & Uses

Q41. Which of the following is/are correct statements?

(1) $K_2Cr_2O_7$ has orange colour due to charge transfer

(2) Zn, Cd and Hg are not considered as transition metals

(3) Tungsten has a very high melting point

(4) All of these

[E] Explanation

All three are established facts from earlier in this DPP series (charge-transfer colour – TYPE 3 here; Zn/Cd/Hg not transition metals – DPP-01; tungsten's extreme melting point – DPP-02).

[Ans] Answer

Option (4) All of these.

Q42. Which of the statements is not true? **[AIPMT (Prelims)-2012]**

(1) $K_2Cr_2O_7$ solution in acidic medium is orange

(2) $K_2Cr_2O_7$ solution becomes yellow on increasing the pH beyond 7

(3) On passing H_2S through acidified $K_2Cr_2O_7$ solution, a milky colour is observed

(4) $Na_2Cr_2O_7$ is preferred over $K_2Cr_2O_7$ in volumetric analysis

[E] Explanation

(1) and (2) are the established acidic/basic colour facts (TYPE 4). (3) is correct too – H_2S reduces dichromate (to green Cr^{3+}) while itself being oxidised to elemental sulfur, a pale colloidal precipitate that gives a genuinely milky/turbid appearance. (4) is backwards: it's actually **$K_2Cr_2O_7$** that's preferred as the primary standard, precisely *because* it's non-hygroscopic and obtainable in high purity – $Na_2Cr_2O_7$ is hygroscopic (absorbs moisture), making it a poor choice for accurate weighing.

[Ans] Answer

Option (4) $Na_2Cr_2O_7$ is preferred over $K_2Cr_2O_7$ in volumetric analysis – this is NOT true.

Q43. How many statements are wrong.

(A) Cr^{+3} is green in colour
(B) MnO_4^- is a strong O.A.
(C) The number of d-electrons in Fe^{2+} is 6.
(D) Zn^{2+} is colourless

(1) 0 (2) 1 (3) 3 (4) 2

[E] Explanation

(A) Cr^{3+} is indeed classically described as green – correct. (B) MnO_4^- is a textbook strong oxidising agent – correct. (C) $Fe^{2+} = 3d^6$, so 6 d-electrons – correct. (D) $Zn^{2+} = d^{10}$, colourless – correct. All four statements hold up.

[Ans] Answer

Option (1) 0.

Q44. Where is potassium dichromate used?

(1) In leather industry (2) In textile industry (3) As germicide (4) As bleaching agent in cotton cloths

[E] Explanation

$K_2Cr_2O_7$'s best-known industrial application among these is chrome tanning in the **leather** industry. It's not typically classed as a germicide or a bleaching agent (those roles belong to other oxidisers like chlorine or peroxide).

[Ans] Answer

Option (1) In leather industry.

Q45. Which of the following is a use of potassium dichromate?

(1) To oxidise ferrous ions into ferric ions in acidic medium as an oxidizing agent
(2) As an insecticide
(3) In electroplating
(4) As a reducing agent

[E] Explanation

This entire DPP has been one long demonstration of $K_2Cr_2O_7$ as an **oxidising** agent (oxidising Fe^{2+}, SO_2, Sn^{2+}, H_2S) – so it's never a reducing agent (ruling out option 4), and its classic titrimetric use is exactly oxidising Fe^{2+} to Fe^{3+} in acidic medium.

[Ans] Answer

Option (1) To oxidise ferrous ions into ferric ions in acidic medium as an oxidizing agent.

Every reaction of $K_2Cr_2O_7$ in this DPP reduces to the same half-equation – Cr(VI) wanting very badly to become green Cr(III).

– Your Weird Chemist