



## CHEMISTRY

### BOOKS - UNIVERSAL BOOK DEPOT 1960 CHEMISTRY (HINGLISH)

#### SOME BASIC CONCEPTS OF CHEMISTRY

Ordinary Thinking (Objective Questions) Matter and Units for measurement

1. In the final answer of the expression  $\frac{(29.2 - 20.2)(1.79 \times 10^5)}{1.37}$ . The number of significant figures is

A. 1

B. 2

C. 3

D. 4

**Answer: B**



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2. Dimensions of pressure are same as that of

A. Energy

B. Force

C. energy per unit volume

D. Force per unit volume

**Answer: C**



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3. The significant figures in 3400 are

A. 2

B. 5

C. 6

D. 4

**Answer: D**



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4. A mixture of  $ZnCl_2$  and  $PbCl_2$  can be separated by

A. Distillation

B. Crystallization

C. Sublimation

D. Adding acetic acid

**Answer: D**





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5. One fermi is

A.  $10^{-13}$  cm

B.  $10^{-15}$  cm

C.  $10^{-10}$  cm

D.  $10^{-12}$  cm

Answer: A



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6. The number of significant figure in 60.001 are

A. 5

B. 6

C. 3

D. 2

**Answer: B**



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7. Given  $P = 0.0030m$ ,  $Q = 2.40m$ ,  $R = 3000m$ , Significant figures in  $P$ ,  $Q$  and  $R$  are respectively

A. 2,2,1

B. 2,3,4

C. 4,2,1

D. 4,2,3

**Answer: B**



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8. The prefix  $10^{18}$  is

- A. Giga
- B. Nano
- C. Mega
- D. Exa

**Answer: D**



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9. A mixture of sand and iodine can be separated by

- A. Crystallisation
- B. Sublimation
- C. Distillation
- D. Fractional distillation

**Answer: B**

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10. One part of element A reacts with two parts of another element B. 6 parts of element C reacts with 4 parts of element B. If A and C combine together, the ratio of their weights be governed by

- A. Law of definite proportion
- B. Law of multiple proportion
- C. Law of reciprocal proportion
- D. Law of conservation of mass

**Answer: C**

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11. The prefix zepto stands for

A.  $10^9$

B.  $10^{-12}$

C.  $10^{-15}$

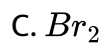
D.  $10^{-21}$

**Answer: D**



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12. Which of the following halogen can be purified by sublimation





**Answer: D**



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**13.** One atmosphere is equal to

A. 101.325 K pa

B. 1013.25 K pa

C.  $10^5$  Nm

D. None of these

**Answer: A**



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**14.** A sample was weighted using two different balances. The result's were (i) 3.929 g (ii) 4.0 g. how would the weight of the sample be

reported. If it has to be reported in 3 significant no

A. 3.929 g

B. 3 g

C. 3.9 g

D. 3.93 g

**Answer: D**



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**15. Which one of the following is not an element**

A. Diamond

B. Graphite

C. Silica

D. Ozone

**Answer: C**



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16. 81.4g sample of ethyl alcohol contains 0.002g of water. The amount of pure ethyl alcohol to the proper number of significant figures is

A. 81.4

B. 71.40 g

C. 91.4 g

D. 81 g

**Answer: A**



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17. The unit  $JPa^{-1}$  is equivalent to

A.  $m^3$

B.  $cm^3$

C.  $dm^3$

D. None of these

**Answer: A**



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18. From the following masses, the one which is expressed nearest to the milligram is

A. 16 g

B. 16.4 g

C. 16.428 g

D. 16.4284 g

**Answer: C**

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**19.** Assertion: Atoms can neither be created nor destroyed.

Reason: Under similar condition of temperature and pressure, equal volume of gases does not contain equal number of atoms.

- A. If both assertion and reason are true and the reason is the correct explanation of the assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of the assertion.
- C. If assertion is true but reason is false.
- D. If the assertion and reason both are false.

**Answer: C**



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20. Assertion : 1.231 has three significant figures.

Reason : All numbers right to the decimal point are significant.

- A. If both assertion and reason are true and the reason is the correct explanation of the assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of the assertion.
- C. If assertion is true but reason is false.
- D. If the assertion and reason both are false.

**Answer: D**



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**21. Assertion :** Pure water obtained from different sources such as river, well, spring, sea etc. always contains hydrogen and oxygen combined in the ratio 1 : 8 by mass.

**Reason :** A chemical compound always contains elements combined together in same proportion by mass, it was discovered by French chemist, Joseph Proust (1799).

- A. If both assertion and reason are true and the reason is the correct explanation of the assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of the assertion.
- C. If assertion is true but reason is false.
- D. If the assertion and reason both are false.

**Answer: A**



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**22. Assertion :** A certain element X, forms binary compounds with chlorine containing 59.68%, 68.95 % and 74.75% chlorine respectively.

These data illustrate the law of multiple proportions.

**Reason :** According to law of multiple proportions, the relative amount of an element combining with some fixed amount of a second element in a series of compounds are the ratios of small whole numbers.

- A. If both assertion and reason are true and the reason is the correct explanation of the assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of the assertion.
- C. If assertion is true but reason is false.
- D. If the assertion and reason both are false.

**Answer: A**



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**23.** Assertion : Gases combine in simple ratio of their volume but, not always.

Reason : Gases deviate from ideal behaviour.

- A. If both assertion and reason are true and the reason is the correct explanation of the assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of the assertion.
- C. If assertion is true but reason is false.
- D. If the assertion and reason both are false.

**Answer: A**



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**24.** Assertion: Isomorphous substances form crystals of same shape and can grow in saturated solution of each other.

Reason: They have similar constitution and chemical formulae.

- A. If both assertion and reason are true and the reason is the correct explanation of the assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of the assertion.
- C. If assertion is true but reason is false.
- D. If the assertion and reason both are false.

**Answer: A**

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**Ordinary Thinking (Objective Questions) Atomic, Molecular and Equivalent masses**

1. The number of moles of oxygen in 1 L of air containing 21% oxygen by volume, in standard conditions, is

A. 0.186 mol

B. 0.21 mol

C. 2.10 mol

D. 0.0093 mol

**Answer: D**



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2. The number of atoms in 4.25 g of  $NH_3$  is approximately

A.  $1 \times 10^{23}$

B.  $2 \times 10^{23}$

C.  $4 \times 10^{23}$

D.  $6 \times 10^{23}$

**Answer: D**





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3. Assuming fully decomposed, the volume of  $CO_2$  released at STP on heating 9.85 g of  $BaCO_3$  (Atomic mass of Ba=137) will be

A. 0.84 L

B. 2.24 L

C. 4.06 L

D. 1.12 L

Answer: D



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4. An element X has the following isotopic composition:

$^{200}X$ : 90%  $^{199}X$ : 8.0%  $^{202}X$ : 2.0%

The weight average atomic mass of the naturally occurring element X is closest to

A. 200 amu

B. 201 amu

C. 202 amu

D. 199 amu

**Answer: C**



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5. The weight of a molecule of the compound  $C_{60}H_{122}$  is

A.  $1.4 \times 10^{-21} g$

B.  $1.09 \times 10^{-21} g$

C.  $5.025 \times 10^{23} g$

D.  $16.023 \times 10^{23} g$

**Answer: A**



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6. The number of molecules in 8.96L of a gas at  $0^{\circ}C$  and 1 atmosphere pressure is approximately

A.  $6.02 \times 10^{23}$

B.  $12.04 \times 10^{23}$

C.  $18.06 \times 10^{23}$

D.  $24.08 \times 10^{22}$

Answer: D



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7. What is the concentration of nitrate ions if equal volumes of  $0.1M AgNO_3$  and  $0.1M NaCl$  are mixed together?

A. 0.1 M

B. 0.2 M

C. 0.05 M

D. 0.25 M

**Answer: C**

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8. 74.5g of a metallic chloride contain 35.5g of chlorine. The equivalent weight of the metal is

A. 19.5

B. 35.5

C. 39.0

D. 78.0

**Answer: C**

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9. When potassium permanganate is titrated against ferrous ammonium sulphate, the equivalent weight of potassium permanganate is

- A. Molecular weight /10
- B. Molecular weight /5
- C. Molecular weight /2
- D. Molecular weight

**Answer: B**

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10. 0.75 g platinum chloride, a monoacid base on ignition gave 0.245 g platinum. The molecular weight of the base is



A. 75.0

B. 93.5

C. 100

D. 80.0

**Answer: B**



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11. In acidic medium, equivalent weight of  $K_2Cr_2O_7$  (molecular weight =  $M$ ) is

A.  $M/3$

B.  $M/4$

C.  $M/6$

D.  $M/2$

**Answer: C**



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12. The number of moles of oxygen obtained by the electrolytic decomposition of 108 g water is

A. 2.5

B. 3

C. 5

D. 7.5

**Answer: B**



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13. The number of equivalents of  $N_2S_2O_3$  required for the volumetric estimation of one equivalent of  $Cu^{2+}$  is

A. 1

B. 2

C.  $3/2$

D. 3

**Answer: B**



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14. The percentage of element M is 53 in its oxide of molecular formula  $M_2O_3$ . Its atomic mass is about

A. 45

B. 9

C. 18

D. 27

**Answer: D**



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15. A metal M of equivalent mass  $E$  forms an oxide of molecular formula  $M_xO_y$ . The atomic mass of the metal is given by the correct equation.

A.  $2E(y/x)$

B.  $xyE$

C.  $E/y$

D.  $y/E$

**Answer: A**



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16. Arrange the following in the order of increasing mass (at. Mass of O=16, Cu=63, N=14)

(I) one atom of oxygen (II) one atom of nitrogen

(III)  $1 \times 10^{-10}$  mole of oxygen (IV)  $1 \times 10^{-10}$  mole of copper

A.  $II < I < III < IV$

B.  $I < II < III < IV$

C.  $III < II < IV < I$

D.  $IV < II < III < I$

**Answer: A**

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17. What is the volume of  $CO_2$  liberated in litres at 1 atmosphere and  $0^\circ C$  when 10% of 100 pure calcium carbonate is treated with excess dilute sulphuric acid? (at mass of Ca=40, C=12, O=16)

A. 0.224

B. 2.24

C. 22.4

D. 224

**Answer: B**



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**18.** When 100 ml 1N-NaOH solution and 10 ml of 10 N sulphuric acid solution are mixed together, the resulting solution will be

A. Alkaline

B. Acidic

C. Atrongly acidic

D. Neutral

**Answer: D**



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**19.** 1.520g of the hydroxide of a metal on ignition gave 0.995g of oxide.

The equivalent weight of metal is

A. 1.520

B. 0.995

C. 19.00

D. 9.00

**Answer: D**



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20. The equivalent weight of a metal is 9 and vapour density of its chloride is 59.25. The atomic weight of metal is :

A. 23.9

B. 27.3

C. 36.3

D. 48.3

**Answer: A**

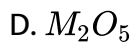
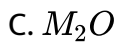
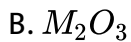


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21. On reduction with hydrogen, 3.6g of an oxide of metal left 3.2g of metal. If the vapour density of metal is 32, the simplest formula of the oxide would be

A.  $MO$





**Answer: C**

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22. Sulphur forms the chlorides  $S_2Cl_2$  and  $SCL_2$ . The equivalent mass of sulphur in  $SCL_2$  is

A. 8 g/mol

B. 16 g/mol

C. 64.8 g/mol

D. 32 g/mol

**Answer: B**

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23. 1.5g  $CdCl_2$  was formed to contain 0.9g Cd. Calculate the atomic weight of Cd.

- A. 118
- B. 112
- C. 106.5
- D. 53.25

**Answer: B**



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24. One litre of a gas at STP weight 1.16 g it can possibly be

- A.  $C_2H_2$
- B.  $CO$

C.  $O_2$

D.  $CH_4$

**Answer: A**

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25. 0.32 g of metal gave on treatment with an acid 112 mL of hydrogen at NTP. Calculate the equivalent weight of the metal

A. 58

B. 32

C. 11.2

D. 24

**Answer: B**

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26. Equivalent weight of crystalline oxalic acid is

A. 30

B. 63

C. 53

D. 45

**Answer: B**



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27. The modern atomic weight scale is based on

A.  $C^{12}$

B.  $O^{16}$

C.  $H^1$

D.  $C^{13}$

**Answer: A**

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**28.** In the reaction of sodium thiosulphate with  $I_2$  in aqueous medium, the equivalent mass of sodium sulphate

- A. Molar mass of sodium thiosulphate
- B. The average of molar masses of  $Na_2S_2O_3$  and  $I_2$
- C. Half the molar mass of sodium thiosulphate
- D. Molar mass of sodium thiosulphate  $\times 2$

**Answer: A**

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29. To dissolve 0.9 g metal, 100 mL of 1 N HCl is used. What is the equivalent weight of metal?

A. 7

B. 9

C. 10

D. 6

**Answer: B**



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30.  $M$  is molecular weight of  $KMnO_4$ . The equivalent weight of  $KMnO_4$  when it is converted into  $K_2MnO_4$  is

A. Molecular weight /10

B.  $M/3$

C.  $M/5$

D.  $M/7$

**Answer: A**

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**31.** For preparing 0.1 N solution of a compound from its impure sample, of which the percentage purity is known, the weight of the substance required will be

A. More than the theoretical weight

B. Less than the theoretical weight

C. Same as the theoretical weight

D. None of these

**Answer: A**

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32. If the molecular weight of  $H_3PO_3$  is M, its equivalent weight will be

A. M

B.  $M/2$

C.  $M/3$

D.  $2M$

**Answer: B**



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33. Which one of the following properties of an element is not variable

?

A. Valency

B. Atomic weight



C. Equivalent weight

D. All of these

**Answer: B**

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34. In chemical scale, the relative mass of the isotopic mixture of oxygen atoms ( $O^{16}$ ,  $O^{17}$ ,  $O^{18}$ ) is assumed to be equal to

A. 16.002

B. 16.00

C. 17.00

D. 11.00

**Answer: C**

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35. The mass of a molecule of water is

A.  $3 \times 10^{-26}$  kg

B.  $3 \times 10^{-25}$  kg

C.  $1.5 \times 10^{-26}$  kg

D.  $2.5 \times 10^{-26}$  kg

**Answer: A**



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36. The value of amu is equal to

A.  $1.57 \times 10^{-24}$  kg

B.  $1.66 \times 10^{-24}$  kg

C.  $1.99 \times 10^{-23}$  kg

D.  $1.66 \times 10^{-27}$  kg

**Answer: D**



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37. If we consider that  $1/6$ , in place of  $1/12$ , mass of carbon atom is taken to be the relative atomic mass unit, the mass of one mole of a substance will.

- A. Decrease twice
- B. Increase two fold
- C. Remain unchanged
- D. Be a function of the molecular mass of the substance

**Answer: B**



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38. The number of hydrogen atoms present in 25.6g of sucrose ( $C_{12}H_{22}O_{11}$ ) which has a molar mass of 342.3g is :

A.  $22 \times 10^{23}$

B.  $9.91 \times 10^{23}$

C.  $11 \times 10^{23}$

D.  $44 \times 10^{23}$  H atoms

Answer: B

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39. 100 mL of  $PH_3$  on decomposition produced phosphorus and hydrogen. The change in volume is

A. 50 mL increase

B. 500 mL decrease

C. 900 mL decrease

D. Nil

**Answer: A**

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**40.** Which of the following has least mass

A. 2 g atom of nitrogen

B.  $3 \times 10^{23}$  atom of C

C. 1 mole of S

D. 7.0 g of Ag

**Answer: B**

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41. The molecular weight of a gas is 45. Its density at STP is

A. 22.4

B. 11.2

C. 5.7

D. 2.0

**Answer: D**



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42. A bivalent metal has an equivalent mass of 32. The molecular mass of the metal nitrate is

A. 168

B. 192

C. 188

D. 182

Answer: C



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43. 1 amu is equal to

A.  $\frac{1}{12}$  of  $C - 12$

B.  $\frac{1}{14}$  of  $O - 16$

C. 1 g of  $H_2$

D.  $1.66 \times 10^{-23}$  kg

Answer: D



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44. 1.25g of a solid dibasic acid is completely neutralised by 25mL of 0.25 molar  $Ba(OH_2)$  solution. Molecular mass of the acid is:

A. 100

B. 150

C. 120

D. 200

**Answer: D**



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**45.** 1.24 g P is present in 2.2 g

A.  $P_4S_3$

B.  $P_2S_2$

C.  $PS_2$

D.  $P_2S_4$

**Answer: A**





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46. The atomic weights of two elements A and B are 40 and 80 respectively. If  $x$  g of A contains  $y$  atoms, how many atoms are present in  $2x$  g of B?

A.  $\frac{y}{2}$

B.  $\frac{y}{4}$

C.  $y$

D.  $2y$

Answer: C



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47. If  $N_A$  is Avogadro's number then number of valence electrons in 4.2 g of nitride ions ( $N^{3-}$ )

A.  $2.4 N_A$

B.  $4.2 N_A$

C.  $1.6 N_A$

D.  $3.2 N_A$

**Answer: A**



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**48.** The number of molecule at NTP in 1 ml of an ideal gas will be

A.  $6 \times 10^{23}$

B.  $2.69 \times 10^{19}$

C.  $2.69 \times 10^{23}$

D. None of these

**Answer: B**





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49. The specific heat of a metal is 0.16 its approximate atomic weight would be

A. 32

B. 16

C. 40

D. 64

**Answer: C**



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50. What volume of  $NH_3$  gas at STP would be needed to prepare 100 ml of 2.5 molal (2.5 m) ammonium hydroxide solution?

A. 0.056 litres

B. 0.56 litres

C. 5.6 litres

D. 11.2 litres

**Answer: C**

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**51.** Caffeine has a molecular weight of 194. If it contains 28.9 % by mass of nitrogen, number of atoms of nitrogen in one molecule of caffeine is

A. 4

B. 6

C. 2

D. 3

**Answer: A**

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52. A 400 mg iron capsule contains 100 mg of ferrous fumarate,  $(CHCOO)_2Fe$ . The percentage of iron present in it is approximately

- A. 0.33
- B. 0.25
- C. 0.14
- D. 0.08

**Answer: D**

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53. A gaseous mixture contain  $CH_4$  and  $C_2H_6$  in equimolecular proportion. The weight of 2.24 litres of this mixture at NTP is

- A. 4.6 g

B. 1.6 g

C. 2.3 g

D. 23 g

**Answer: C**



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**54.** One gram of hydrogen is found to combine with 80 g of bromine  
one gram of calcium (valency = 2) combines with 4 g of bromine the  
equivalent weight of calcium is

A. 10

B. 20

C. 40

D. 80

**Answer: B**



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55. Assertion: Molecular weight of oxygen is 16.

Reason: Atomic weight of oxygen is 16.

- A. If both assertion and reason are true and the reason is the correct explanation of the assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of the assertion.
- C. If assertion is true but reason is false.
- D. If assertion is false but reason is true.

**Answer: D**



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56. Assertion : Equivalent weight of a base =  $\frac{\text{Molecular weight}}{\text{Acidity}}$

Reason : Acidity is the number of replaceable hydrogen atoms in one molecule of the base.

- A. If both assertion and reason are true and the reason is the correct explanation of the assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of the assertion.
- C. If assertion is true but reason is false.
- D. If the assertion and reason both are false.

**Answer: C**



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57. Assertion : One atomic mass unit (amu) is mass of an atom equal to exactly one-twelfth of the mass of a carbon-12 atom.



Reason : Carbon-12 isotope was selected as standard.

- A. If both assertion and reason are true and the reason is the correct explanation of the assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of the assertion.
- C. If assertion is true but reason is false.
- D. If the assertion and reason both are false.

**Answer: A**



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**58.** Assertion : Molecular mass of A is  $\frac{M}{4}$  if the molecular mass of B is M.

Reason : Vapour density of A four times that of B.

- A. If both assertion and reason are true and the reason is the correct explanation of the assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of the assertion.
- C. If assertion is true but reason is false.
- D. If the assertion and reason both are false.

**Answer: C**

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59. Assertion : Equivalent weight of  $Cu$  in  $CuO$  is 63.6 and in  $Cu_2O$  31.8.

Reason : Equivalent weight of an element

$$= \frac{\text{Atomic weight of the element}}{\text{Valency of the element}}$$

- A. If both assertion and reason are true and the reason is the correct explanation of the assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of the assertion.
- C. If assertion is true but reason is false.
- D. If assertion is false but reason is true.

**Answer: D**

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**60.** Assertion : 1 amu equals to  $1.66 \times 10^{-24}$  g.

Reason :  $1.66 \times 10^{-24}$  g equals to  $\frac{1}{12}$  th of mass of a  $C^{12}$  atom.

- A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

**Answer: A**

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**61.** Assertion :- Equivalent weight of  $NH_3$  in the reaction  $N_2 \rightarrow NH_3$  is  $17/3$  while that of  $N_2$  is  $28/6$ .

Reason :- Equivalent weight = 
$$\frac{\text{Molecular weight}}{\text{number of } e^- \text{ lost or gained/mole}}$$

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

- C. If assertion is true but reason is false.
- D. If the assertion and reason both are false.

**Answer: A**

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### Ordinary Thinking (Objective Questions) The mole concept

1. The number of oxygen atoms in 4.4 g of  $CO_2$  is approximately

- A.  $1.2 \times 10^{23}$
- B.  $6 \times 10^{22}$
- C.  $6 \times 10^{23}$
- D.  $12 \times 10^{23}$

**Answer: A**

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2. Molarity of liquid HCl with density equal to  $1.17\text{g/mL}$  is:

- A. 36.5
- B. 18.25
- C. 35.05
- D. 4.65

**Answer: C**



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3. How many moles of lead (II) chloride will be formed from a reaction between 6.5 g of PbO and 3.2 g of HCl?

- A. 0.011
- B. 0.029

C. 0.044

D. 0.333

**Answer: B**

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4. The number of atoms in 0.1 mole of a triatomic gas is \_\_\_\_\_.

$$\left(N_A = 6.02 \times 10^{23} \text{ mol}^{-1}\right)$$

A.  $1.800 \times 10^{22}$

B.  $6.026 \times 10^{22}$

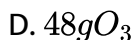
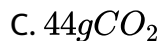
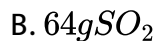
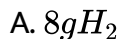
C.  $1.806 \times 10^{23}$

D.  $3.600 \times 10^{23}$

**Answer: C**

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5. Which has the maximum number of molecules among the following

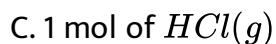
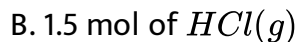
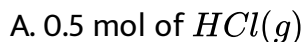


**Answer: A**



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6. When  $22.4L$  of  $H_2(g)$  is mixed with  $11.2$  of  $Cl_2(g)$ , each at STP, the moles of  $HCl(g)$  formed is equal to





D. 2 mol of  $HCl(g)$

**Answer: C**

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7. The number of water molecules is maximum in

A. 18 molecules of water

B. 1.8 gram of water

C. 18 gram of water

D. 18 moles of water

**Answer: D**

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8. If Avogadro number  $N_A$  is changed from  $6.022 \times 10^{23} \text{mol}^{-1}$  to  $6.022 \times 10^{20} \text{mol}^{-1}$ , this would change:

- A. The definition of mass in units of grams
- B. The mass of one mole of carbon
- C. the ratio of chemical species to each other in a balanced equation
- D. The ratio of elements to each other in a compound

**Answer: B**

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9. The maximum amount of  $BaSO_4$  precipitated on mixing  $BaCl_2$  (0.5 M) with  $H_2SO_4$  (1M) will correspond to

- A. 0.5 M

B. 1.0 M

C. 18 moles

D. 100 moles

**Answer: A**



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**10.** The number of moles of sodium oxide in 620 g of it is

A. 1 mol

B. 10 moles

C. 18 moles

D. 100 moles

**Answer: B**



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11. 80 g of oxygen contains as many atoms as in

A. 10 g of hydrogen

B. 5 g of hydrogen

C. 80 g of hydrogen

D. 1 g of hydrogen

**Answer: B**



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12. The number of sodium atoms in 2 moles of sodium ferrocyanide is

A.  $12 \times 10^{23}$

B.  $26 \times 10^{23}$

C.  $34 \times 10^{23}$

D.  $48 \times 10^{23}$

**Answer: D**

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13. The total number of gram-molecules of  $SO_2Cl_2$  in 13.5 g of sulphuryl chloride is

A. 0.1

B. 0.2

C. 0.3

D. 0.4

**Answer: A**

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14. The molarity of orthophosphoric acid having purity of 70% by weight and specific gravity 1.54 would be

A. 11 M

B. 22 M

C. 33 M

D. 44 M

**Answer: A**



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15. Number of atoms of  $He$  in 100 atoms of  $He$  (at.mass 4 amu) is

A. 25

B. 100

C. 50

D.  $100 \times 6 \times 10^{-23}$

**Answer: A**

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**16.** If 1 ml of water contains 20 drops. Then no. of molecules in a drop of water is

A.  $6.023 \times 10^{23}$  molecules

B.  $1.376 \times 10^{26}$  molecules

C.  $1.677 \times 10^{21}$  molecules

D.  $4.346 \times 10^{20}$  molecules

**Answer: C**

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17. In an experiment, 4g of  $M_2O_x$  oxide was reduced to 2.8g of the metal. If the atomic mass of the metal is  $56\text{g mol}^{-1}$ , the number of oxygen atoms in the oxide is:

A. 1

B. 2

C. 3

D. 4

**Answer: C**



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18. A sample of phosphorus trichloride ( $PCl_3$ ) contains 1.4 moles of the substance. How many atoms are there in the sample ?

A. 4



B. 5.6

C.  $8.431 \times 10^{23}$

D.  $3.372 \times 10^{24}$

**Answer: D**



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**19.** Which among the following is the heaviest?

A. One mole of oxygen

B. One molecule of sulphur trioxide

C. 100 amu of uranium

D. Ten moles of hydrogen

**Answer: C**



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20. Which one of the following is the lightest?

- A. 0.2 mole of hydrogen gas
- B.  $6.023 \times 10^{22}$  molecules of nitrogen
- C. 0.1 g of silver
- D. 0.1 mole of oxygen gas

Answer: C



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21. The number of water molecules in 1L of water is :

- A. 18
- B.  $18 \times 1000$
- C.  $N_A$
- D.  $55.55N_A$

**Answer: D**



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22. The number of moles of  $BaCO_3$  which contains 1.5 moles of oxygen atoms is

A. 0.5

B. 1

C. 3

D.  $6.02 \times 10^{23}$

**Answer: A**



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23. 250 ml of a sodium carbonate solution contains 2.65 grams of  $Na_2CO_3$ . If 10 ml of this solution is diluted to one litre, what is the concentration of the resultant solution (mol. Wt. of  $Na_2CO_3 = 106$ )

- A. 0.1 M
- B. 0.001 M
- C. 0.01 M
- D.  $10^{-4}$  M

**Answer: B**



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24. The mass of 1 mole of neutrons ( $m_n = 1.675 \times 10^{-27}$  kg) is:

- A.  $1.800 \times 10^{-3}$  kg
- B.  $1.008 \times 10^{-4}$  kg

C.  $1.080 \times 10^{-3} \text{ kg}$

D.  $1.008 \times 10^{-3} \text{ kg}$

**Answer: D**

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**25. Which has maximum number of atoms**

A. 24 gms of  $C_{(12)}$

B. 56 gms of  $Fe_{(56)}$

C. 27 gms of  $Al_{(27)}$

D. 108 gms of  $Ag_{(108)}$

**Answer: A**

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26. In INCORRECT statement for 14 g of CO is \_\_\_\_\_.

A. It occupies 2.24 litre at NTP

B. It corresponds to  $\frac{1}{2}$  mole of CO

C. It corresponds to same mole of CO and N<sub>2</sub>

D. It corresponds to  $3.01 \times 10^{23}$  molecules of CO

**Answer: A**

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27. The total number of protons in 10g of calcium carbonate is

( $N_0 = 6.023 \times 10^{23}$ )

A.  $1.5057 \times 10^{24}$

B.  $2.0478 \times 10^{24}$

C.  $3.0115 \times 10^{24}$

D.  $4.0956 \times 10^{24}$

**Answer: C**



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**28.** The number of formula units of calcium fluoride  $CaF_2$  present in 146.4 g of  $CaF_2$  (The molar mass of  $CaF_2$  is 78.08 g/mol) is

A.  $1.129 \times 10^{24} CaF_2$

B.  $1.146 \times 10^{24} CaF_2$

C.  $7.808 \times 10^{24} CaF_2$

D.  $1.877 \times 10^{24} CaF_2$

**Answer: A**



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**29.** Volume occupied by one molecule of water (density =  $1 \text{ g cm}^{-3}$ )

A.  $3.0 \times 10^{-23} \text{ cm}^3$

B.  $5.5 \times 10^{-23} \text{ cm}^3$

C.  $9.0 \times 10^{-23} \text{ cm}^3$

D.  $6.023 \times 10^{-23} \text{ cm}^3$

**Answer: A**



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**30.** The number of gram atom of oxygen in  $6.02 \times 10^{24}$  CO molecules is

-----

A. 1

B. 0.5

C. 5

D. 10



**Answer: D**

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**31.** The number of moles of hydrogen that can be added to 1 mole of an oil is the highest in

- A. Linseed oil
- B. Groundanut oil
- C. Sunflower seed oil
- D. Mustard oil

**Answer: A**

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**32.** Mass of 0.1 mole of methane is

A. 1.6 g

B. 0.1 g

C. 1 g

D. 16 g

**Answer: A**

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**33.** Sodium nitrate on reduction with Zn in presence of NaOH solution produces  $NH_3$ . Mass of sodium nitrate nitrate absorbing 1 mole of electron will be

A. 7.750

B. 10.625

C. 8.000

D. 9.875

**Answer: B**



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**34.** 1 mole of methylamine on reaction with nitrous acid gives at NTP:

- A. 1.0 Litre of nitrogen
- B. 22.4 Litre of nitrogen
- C. 11.2 Litre of nitrogen
- D. 5.6 Litre of nitrogen

**Answer: B**



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**35.** 100 mL of  $O_2$  and  $H_2$  are kept at same temperature and pressure.

What is true about their number of molecules ?

A.  $N_{O_2} > N_{H_2}$

B.  $N_{O_2} < N_{H_2}$

C.  $N_{O_2} = N_{H_2}$

D.  $N_{O_2} + N_{H_2} = 1 \text{ mole}$

**Answer: C**



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**36.** Common salt obtained from sea water contains 95%  $NaCl$  by mass. The approximate number of molecules present in 10.0g of the salt is

A.  $10^{21}$

B.  $10^{22}$

C.  $10^{23}$

D.  $10^{24}$

**Answer: C**



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**37.** Which of the following is Loschmidt number

A.  $6 \times 10^{23}$

B.  $2.69 \times 10^{19}$

C.  $3 \times 10^{23}$

D. None of these

**Answer: B**



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**38.** Assertion: Volume of a gas is inversely proportional to the number of moles of a gas.

Reason: The ratio by volume of gaseous reactants and products is in agreement with their molar ratio.

- A. If both assertion and reason are true and the reason is the correct explanation of the assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of the assertion.
- C. If assertion is true but reason is false.
- D. If assertion is false but reason is true.

**Answer: D**



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**39.** Assertion : One mole of  $SO_2$  contains double the number of molecules present in one mole of  $O_2$

Reason : Molecular weight of  $SO_2$  is double to that of  $O_2$ .

- A. If both assertion and reason are true and the reason is the correct explanation of the assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of the assertion.
- C. If assertion is true but reason is false.
- D. If assertion is false but reason is true.

**Answer: D**



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**40.** Assertion : 22.4 L of  $N_2$  at NTP and 5.6 L  $O_2$  at NTP contain equal number of molecules.

Reason : Under similar conditions of temperature and pressure all gases contain equal number of molecules.

- A. If both assertion and reason are true and the reason is the correct explanation of the assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of the assertion.
- C. If assertion is true but reason is false.
- D. If assertion is false but reason is true.

**Answer: D**



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**41.** Assertion: As mole is the basic chemical unit, the concentration of the dissolved solute is usually specified in terms of number of moles of solute.

Reason: The total number of molecules of reactants involved in a balanced chemical equation is known as molecularity of the reaction.



- A. If both assertion and reason are true and the reason is the correct explanation of the assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of the assertion.
- C. If assertion is true but reason is false.
- D. If the assertion and reason both are false.

**Answer: B**



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**42.** Assertion : Atomicity of oxygen is 2.

Reason : 1 mole of an element contains  $6.023 \times 10^{23}$  atoms.

- A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

- B. If both assertion and reason are true but reason is not the correct explanation of the assertion.
- C. If assertion is true but reason is false.
- D. If the assertion and reason both are false.

**Answer: B**

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**43.** In which case is the number of molecules of water maximum?

- A. 18 mL of water
- B. 0.18g of water
- C. 0.00224 L of water vapours at 1 atm and 273 K
- D.  $10^{-3}$  mol of water

**Answer: A**



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## Ordinary Thinking (Objective Questions) Chemical stoichiometry

1. The solution of sulphuric acid contains 80% by weight  $H_2SO_4$ .

Specific gravity of this solution is 1.71. Its normality is about

A. 18.0

B. 27.9

C. 1.0

D. 10.0

**Answer: B**



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2. Under similar conditions of pressure and temperature, 40 ml of slightly moist hydrogen chloride gas is mixed with 20 ml of ammonia gas, the final volume of gas at the same temperature and pressure will be

A. 100 ml

B. 20 ml

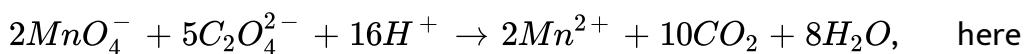
C. 40 ml

D. 60 ml

**Answer: B**

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3.  $KMnO_4$  react with oxalic acid according to the equation,



20ml of 0.1M  $KMnO_4$  is equivalent to

A. 20 ml of 0.5 M  $H_2C_2O_4$

B. 50 ml of 0.1 M  $H_2C_2O_4$

C. 50 ml of 0.5 M  $H_2C_2O_4$

D. 20 ml of 0.1 M  $H_2C_2O_4$

**Answer: B**



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4. A compound contains atoms A, B and C. the oxidation number of A is +2, of B is +5 and of C is -2. The possible formula of the compound is

A.  $A_3(BC_4)_2$

B.  $A_3(B_4C)_2$

C.  $ABC_2$

D.  $A_2(BC_3)_2$

**Answer: A**



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5. 10 g of hydrogen and 64 g of oxygen were filled in a steel vessel and exploded. Amount of water produced in this reaction will be

A. 2 mol

B. 3 mol

C. 4 mol

D. 1 mol

**Answer: C**



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6. 1.0 g of magnesium is burnt with 0.56 g  $O_2$  in a closed vessel. Which reactant is left in excess and how much?

A.  $Mg$ , 0.44g

B.  $O_2$ , 0.28g

C.  $Mg$ , 0.16g

D.  $O_2$ , 0.16g

**Answer: C**

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7. 20.0 g of a magnesium carbonate sample decomposes on heating to give carbon dioxide and 8.0 g magnesium oxide. What be the percentage purity of magnesium carbonate in the sample?

A. 75

B. 96

C. 60

D. 84

**Answer: D**

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8. What is the mass of the precipitate formed when 50 mL of 16.9% solution of  $AgNO_3$  is mixed with 50 mL of 5.8% NaCl solution?

A. 28 g

B. 3.5 g

C. 7 g

D. 14 g

**Answer: C**

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9. Suppose the elements X and Y combine to form two compounds of  $XY_2$  and  $X_3Y_2$ . When 0.1 mole of  $XY_2$  weighs 10 g and 0.05 mole of  $X_3Y_2$  weighs 9 g, what are the atomic masses of X and Y?

A. 30, 20

B. 40, 30

C. 60, 40

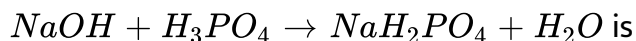
D. 20, 30

Answer: B



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10. The equivalent weight of phosphoric acid ( $H_3PO_4$ ) in the reaction



A. 25

B. 49

C. 59

D. 98

**Answer: D**



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11. During electrolysis of water, the volume of oxygen liberated is  $2.24\text{dm}^3$ . The volume of hydrogen liberated, under same conditions will be

A.  $2.24\text{dm}^3$

B.  $1.12\text{dm}^3$

C.  $4.48\text{dm}^3$

D.  $0.56\text{dm}^3$

**Answer: C**

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12. A solution of  $10\text{ml} \frac{M}{10} \text{FeSO}_4$  was titrated with  $\text{KMnO}_4$  solution in acidic medium. The amount of  $\text{KMnO}_4$  used will be

- A. 5 ml of 0.1 M
- B. 10 ml of 1.1 M
- C. 10 ml of 0.5 M
- D. 10 ml of 0.02 M

**Answer: D**

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13. Equivalent weight of  $KMnO_4$  acting as an oxidant in acidic medium is

- A. The same as its molecular weight
- B. Half of its molecular weight
- C. One-third of its molecular weight
- D. One-fifth of its molecular weight

**Answer: D**

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14. The percentage of  $P_2O_5$  in diammonium hydrogen phosphate is:

- A. 23.48
- B. 46.96
- C. 53.78

D. 71.00

Answer: C

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15.  $KMnO_4$  reacts with ferrous ammonium sulphate according to the equation  $MnO_4^- + 5Fe^{2+} + 8H^+ \rightarrow Mn^{2+} + 5Fe^{3+} + 4H_2O$ , here 10ml of 0.1M  $KMnO_4$  is equivalent to

A. 20 ml of 0.1 M  $FeSO_4$

B. 30 ml of 0.1 M  $FeSO_4$

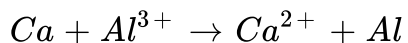
C. 40 ml of 0.1 M  $FeSO_4$

D. 50 ml of 0.1 M  $FeSO_4$

Answer: D

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16. What is the stoichiometric coefficient for Ca in the reaction ?



A. 2

B. 1

C. 3

D. 4

**Answer: C**



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17. When 2.76g of silver carbonate is strongly heated, it yields a residue weighing

A. 2.16 g

B. 2.48 g

C. 2.64 g

D. 2.32 g

**Answer: A**

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**18.** In the complex with formula  $MCl_3 \cdot 4H_2O$  the co-ordination number of the metal M is six. And there is a no molecule of hydration in it. The volume of 0.1 M  $AgNO_3$  solution needed to precipitate the free chloride ions in 200 ml of 0.01 M solution of the complex is

A. 40 ml

B. 20 ml

C. 60 ml

D. 80 ml

**Answer: B**



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19. How many mL of perhydrol is required to produce sufficient oxygen which can be used to completely convert 2 L of  $SO_2$  gas of  $SO_3$  gas?

A. 10 mL

B. 5 mL

C. 20 mL

D. 30 mL

**Answer: A**



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20. One mole of potassium dichromate completely oxidises the following number of moles of ferrous sulphate in acidic medium



A. 1

B. 3

C. 5

D. 6

**Answer: D**

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21.1 g of a mixture of  $NaHCO_3$  and  $Na_2CO_3$  is heated to  $150^\circ C$ . The volume of the  $CO_2$  produced at STP is 112.0 mL. Calculate the percentage of  $Na_2CO_3$  in the mixture ( $Na = 23$ ,  $C = 12$ ,  $O = 16$ )

A. 20

B. 46

C. 84

D. 16

**Answer: D**



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22. In order to prepare one litre normal solution of  $KMnO_4$ , how many grams of  $KMnO_4$  are required if the solution is used in acidic medium for oxidation

A. 158 g

B. 31.6 g

C. 790 g

D. 62 g

**Answer: B**



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23. The oxygen obtained from 72 kg of water is

A. 72 kg

B. 46 kg

C. 50 kg

D. 64 kg

Answer: D



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24. What volume of oxygen gas ( $O_2$ ) measured at  $0^\circ C$  and 1 atm is needed to burn completely 1L of propane gas ( $C_3H_8$ ) measured under the same condition?

A. 5 L

B. 10 L

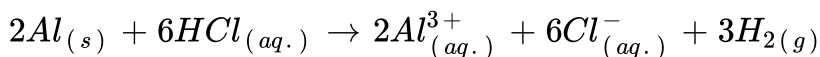
C. 7 L

D. 6 L

**Answer: A**

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**25.** In the reaction:



A.  $6LHCl_{(aq)}$  is consumed for every  $3LH_{2(g)}$  produced

B.  $33.6LH_{2(g)}$  is produced regardless of temperature and pressure  
for every mole Al that reacts

C.  $67.2LH_{2(g)}$  at STP is produced for every mole Al that reacts

D.  $11.2H_{2(g)}$  at STP is produced for every mole  $HCl_{(aq)}$  consumed

**Answer: D**

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26. Acidified potassium permanganate solution is decolourised by

- A. Bleaching powder
- B. White vitriol
- C. Mohr's salt
- D. Microcosmic salt

Answer: C

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27. 12 g of Mg (at. Mass 24) will react completely with acid to give

- A. One mole of  $H_2$
- B.  $1/2$  mole of  $H_2$
- C.  $2/3$  mole of  $O_2$

D. Both  $1/2$  mol of  $H_2$  and  $1/2$  mol of  $O_2$

**Answer: B**

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28.  $Ca(OH)_2 + H_3PO_4 \rightarrow CaHPO_4 + 2H_2O$  the equivalent weight of  $H_3PO_4$  in the above reaction is

A. 21

B. 27

C. 38

D. 49

**Answer: D**

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29. 5 litre of a solution contains 25 mg of  $CaCO_3$ . What is its concentration in ppm? (mol.wt of  $CaCO_3$  is 100)

A. 25

B. 1

C. 5

D. 2500

Answer: C

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30. In the reaction,  $4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(g)$ , when 1 mole of ammonia and 1 mole of  $O_2$  are made to react to completion

A. 1.0 mole of  $H_2O$  is produced

B. 1.0 mole of NO will be produced

C. All the oxygen will be consumed

D. All the ammonia will be consumed

**Answer: C**

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31. 1.5 mol of  $O_2$  combines with Mg to form oxide MgO. The mass of Mg (at. Mass 24) that has combined is

A. 72 g

B. 36 g

C. 48 g

D. 24 g

**Answer: A**

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32. How much of NaOH is required to neutralise  $1500 \text{ cm}^3$  of 0.1 N HCl (Na=23)?

A. 40 g

B. 4 g

C. 6 g

D. 60 g

Answer: C



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33. The decomposition of certain mass of  $\text{CaCO}_3$  gave  $11.2 \text{ dm}^3$  of  $\text{CO}_2$  gas at STP. The mass of KOH required to completely neutralise the gas is:

A. 56 g

B. 28 g

C. 42 g

D. 20 g

**Answer: B**

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**34.** For the reaction  $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$ , the volume of carbon monoxide required to reduce one mole of ferric oxide is

A.  $67.2dm^2$

B.  $11.2dm^2$

C.  $22.4dm^3$

D.  $44.8dm^3$

**Answer: A**

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35. Number of hydrogen ions present in 10 millionth part of  $1.33\text{cm}^3$  of pure water at  $25^\circ\text{C}$  is

- A. 6.023 million
- B. 60 million
- C. 8.01 million
- D. 80.23 million

**Answer: C**



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36. If  $\text{CO}_2$  gas is passed through 500 ml of  $0.5(\text{M})\text{Ca}(\text{OH})_2$ , the amount of  $\text{CaCO}_3$  produced is

- A. 10 g

B. 20 g

C. 50 g

D. 25 g

**Answer: D**



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37. The mass of  $BaCO_3$  produced when excess  $CO_2$  is bubbled through a solution of 0.205 mol  $Ba(OH)_2$  is

A. 81 g

B. 40.5 g

C. 20.25 g

D. 162 g

**Answer: B**



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38. Mohr's salt is dissolved in dil.  $H_2SO_4$  instead of distilled water to

- A. Enhance the rate of dissolution
- B. Prevent cationic hydrolysis
- C. Increase the rate of ionisation
- D. Increase its reducing strength

**Answer: B**



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39. If isobutane and n-butane are present in a gas, then how much oxygen should be required for complete combustion of 5 kg of this gas

- A. 17.9 kg
- B. 9 kg

C. 27 kg

D. 1.8 kg

**Answer: A**

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40. The correct order of stoichiometries of  $AgCl$  formed when  $AgNO_3$  in excess is treated with the complex:

$CoCl_3 \cdot 6NH_3$ ,  $CoCl_3 \cdot 5NH_3$ ,  $CoCl_3 \cdot 4NH_3$  respectively is:

A.  $3AgCl$ ,  $1AgCl$ ,  $2AgCl$

B.  $3AgCl$ ,  $2AgCl$ ,  $1AgCl$

C.  $2AgCl$ ,  $3AgCl$ ,  $1AgCl$

D.  $1AgCl$ ,  $3AgCl$ ,  $2AgCl$

**Answer: B**

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41. A mixture of 2.3 g formic acid and 4.5 g oxalic acid is treated with conc.  $H_2SO_4$ . The evolved gaseous mixture is passed through KOH pellets. Weight (in g) of the remaining product at STP will be

- A. 1.4
- B. 3.0
- C. 2.8
- D. 4.4

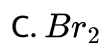
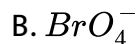
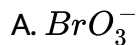
**Answer: C**

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42. Consider the change in oxidation state of Bromine corresponding to different emf values as shown in the diagram below



Then the species undergoing disproportionation is



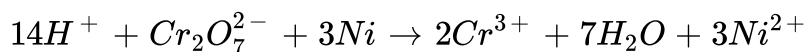
**Answer: D**



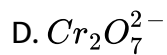
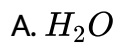
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## Ordinary Thinking (Objective Questions) Oxidation, Reduction, Oxidizing and Reducing agent

1. Which substance is serving as a reducing agent in the following reaction?



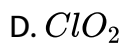
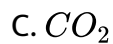
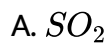




**Answer: B**

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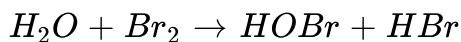
2. The oxide which cannot act as reducing agent is



**Answer: C**

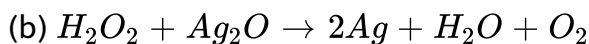
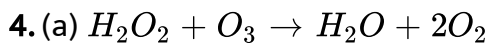
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3. Which is the best description of the behaviour of bromine in the reaction given below



- A. Oxidised only
- B. Reduced only
- C. Proton acceptor only
- D. Both oxidised and reduced

**Answer: D**

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Role of hydrogen peroxide in the above reactions is respectively

- A. Reducing in (i) and (ii)
- B. Oxidizing in (i) and (ii)
- C. Oxidizing in (i) and reducing in (ii)
- D. Reducing in (i) and oxidizing in (ii)

**Answer: C**

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5. The compound that can work both as oxidising and reducing agent is

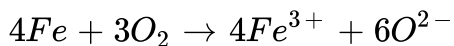
- A.  $KMnO_4$
- B.  $H_2O_2$
- C.  $BaO_2$
- D.  $K_2Cr_2O_7$

**Answer: B**



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6. Following reaction describes the rusting of iron



Which one of the following statements is incorrect?

- A. This is an example of a redox reaction
- B. Metallic iron is reduced to  $Fe^{3+}$
- C.  $Fe^{3+}$  is an oxidising agent
- D. Metallic iron is a reducing agent

**Answer: B**



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7. The strongest reducing agent is



**Answer: D**



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8. Oxidation involves

A. Loss of electrons

B. Gain of electrons

C. Increase in the valency of negative part

D. Decrease in the valency of positive part

**Answer: A**



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**9.** A reducing agent is a substance which can

- A. Accept electron
- B. Donate electrons
- C. Accept protons
- D. Donate protons

**Answer: B**



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**10.** When zinc is added to  $CuSO_4$  solution, copper is precipitated. It is because of

A. Oxidation of  $Cu^{+2}$

B. Reduction of  $Cu^{+2}$

C. Hydrolysis of  $CuSO_4$

D. Ionization of  $CuSO_4$

**Answer: B**

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**11. Which one is oxidising substance?**

A.  $C_2H_2O_2$

B.  $CO$

C.  $H_2S$

D.  $CO_2$

**Answer: D**



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12. In  $C + H_2O \rightarrow CO + H_2$ ,  $H_2O$  acts as

- A. Oxidising agent
- B. Reducing agent
- C. (a) and (b) both
- D. None of these

Answer: A



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13. Which of the following statements are correct concerning redox properties?

- (i) A metal  $M$  for which  $E^\circ$  for the half cell reaction  $M^{n+} + ne^- \rightleftharpoons M$  is very negative will be a good reducing agent.
- (ii) The oxidizing power of the halogen decreases from chlorine to



iodine.

(iii) The reducing power of hydrogen halides increases from hydrogen chloride to hydrogen iodide.

A. (i), (ii) and (iii)

B. (i) and (ii)

C. (i) only

D. (ii) and (iii)

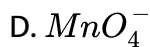
**Answer: A**

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**14.** Which of the following species can function as an oxidising as well as reducing agent ?

A.  $Cl^-$

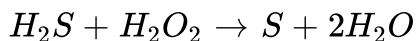
B.  $ClO_4^-$



**Answer: C**

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**15.** In the reaction.



A.  $\text{H}_2\text{S}$  is an acid and  $\text{H}_2\text{O}_2$  is a base

B.  $\text{H}_2\text{S}$  is a base and  $\text{H}_2\text{O}_2$  is an acid

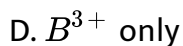
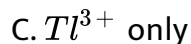
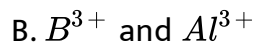
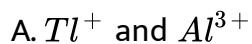
C.  $\text{H}_2\text{S}$  is an oxidizing agent and  $\text{H}_2\text{O}_2$  is a reducing agent

D.  $\text{H}_2\text{S}$  is a reducing agent and  $\text{H}_2\text{O}_2$  is oxidizing agent

**Answer: D**

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16. The ion(s) that act/s as oxidizing agent in solution is/are



Answer: C



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17. Pick out the stronger reducing agent among the following oxyacids of phosphorus

A. Hypophosphorous acid

B. Phosphorous acid

C. Hypophosphoric acid

D. Pyrophosphorous acid

**Answer: A**

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**18.** Which of the following pairs of transition metal ions are the stronger oxidising agents in aqueous solutions

A.  $V^{2+}$  and  $Cr^{2+}$

B.  $Ti^{2+}$  and  $Cr^{2+}$

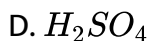
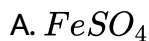
C.  $Mn^{2+}$  and  $Co^{3+}$

D.  $V^{2+}$  and  $Fe^{2+}$

**Answer: C**

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19. Which one is an oxidising agent



Answer: B::D



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20. When copper turnings are added to silver nitrate solution, a blue coloured solution is formed after sometime. It is because, copper

A. Displaces silver from the solution

B. Forms a blue coloured complex with  $AgNO_3$

C. Is oxidised to  $Cu^{2+}$

D. Is reduced to  $Cu^{2+}$

**Answer: A::C**

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**21.** Maximum number of moles of electrons taken up by one mole of  $NO_3^-$  when it is reduced to :

A.  $NH_3$

B.  $NH_2OH$

C.  $NO$

D.  $NO_2$

**Answer: A**

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22. One gas bleaches the colour of flowers by reduction and other by oxidation. These gases are

A.  $CO$  and  $Cl_2$

B.  $SO_2$  and  $Cl_2$

C.  $H_2S$  and  $Br_2$

D.  $NH_2$  and  $SO_2$

**Answer: B**



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23. Which of the following is not a reducing agent?

A.  $NaNO_2$

B.  $NaNO_3$

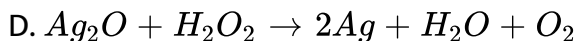
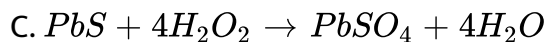
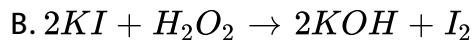
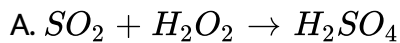
C.  $HI$

D.  $\text{SnCl}_2$

Answer: B

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24. In which of the following reactions,  $\text{H}_2\text{O}_2$  is acting as a reducing agent?



Answer: D

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25.  $H_2O_2$  reduces  $K_4Fe(CN)_6$

- A. In neutral solution
- B. In acidic solution
- C. In non-polar solvent
- D. In alkaline solution

**Answer: B**



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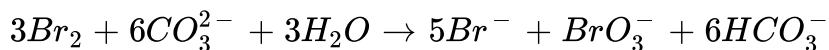
26. In acidic medium, reaction  $MnO_4^- \Leftrightarrow Mn^{2+}$  is an example of -

- A. Oxidation by 3 electrons
- B. Reduction by 3 electrons
- C. Oxidation by 5 electrons
- D. Reduction by 5 electrons

Answer: D

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27. In the following reaction



- A. Bromine is oxidised and carbonate is reduced
- B. Bromine is reduced and water is oxidised
- C. Bromine is neither reduced nor oxidised
- D. Bromine is both reduced and oxidised

Answer: D

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28. In the reaction  $3Mg + N_2 \rightarrow Mg_3N_2$

A. Magnesium is reduced

B. Magnesium is oxidized

C. Nitrogen is oxidized

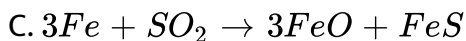
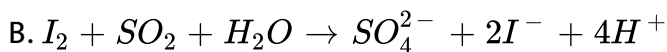
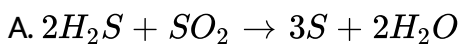
D. None of these

**Answer: B**



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**29.** Reducing property of  $SO_2$  is shown in the reaction



**Answer: B**





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30.  $H_2S$  may provide the colloidal sulphur by

- A. Oxidation
- B. Reduction
- C. Neutralization
- D. Hydrolysis

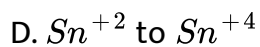
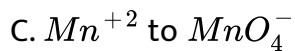
Answer: A



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31. Which one of the following does not get oxidised by bromine water

- A.  $Fe^{+2}$  to  $Fe^{+3}$
- B.  $Cu^{+}$  to  $Cu^{+2}$



**Answer: C**

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32. Of the four oxyacids of chlorine the strongest oxidising agent in dilute aqueous solution is :



**Answer: A**

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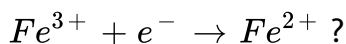
33. In the reaction  $P + NaOH \rightarrow PH_3 + NaH_2PO_2$

- A. P is oxidised only
- B. P is reduced only
- C. P is oxidized as well as reduced
- D. Na is reduced

Answer: C

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34. Which statement is NOT true for the given reaction



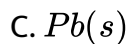
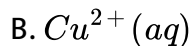
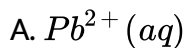
- A.  $Fe^{3+}$  being reduced
- B. Oxidation state of Fe has changed
- C.  $Fe^{3+}$  could be referred to an oxidising agent in this reaction

D. Both  $Fe^{3+}$  and  $Fe^{2+}$  are called acid radicals

**Answer: D**

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**35.** In the reaction  $Pb(s) + Cu^{2+}(aq) \rightarrow Pb^{2+}(aq) + Cu(s)$  which is reducing agent



**Answer: C**

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36. In reaction of hydrogen peroxide and sodium carbonate,  $H_2O_2$  acts as \_\_\_\_.

- A. Oxidising agent
- B. Reducing agent
- C. Bleaching agent
- D. Both oxidising and bleaching agent

**Answer: B**

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37. Several blocks of magnesium are fixed to the bottom of a ship to

- A. Keep away the sharks
- B. Make the ship lighter
- C. Prevent action of water and salt

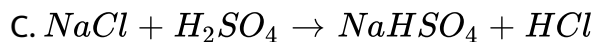
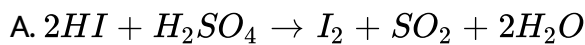


D. Prevent puncturing by under-sea rocks

Answer: C

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38. Which of the following chemical reactions depicts the oxidizing behaviour of  $H_2SO_4$  ?



Answer: A

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39. Strongest reducing agent is-

A. K

B. Mg

C. Al

D. Br

Answer: A



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40. Which of the following acids possesses oxidising, reducing, and complex forming properties ?

A.  $HNO_3$

B.  $H_2SO_4$

C.  $HCl$

D.  $HNO_2$

**Answer: D**

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41. Which is not oxidised by  $MnO_2$ ?

A. F

B. Cl

C. Br

D. I

**Answer: A**

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42. What is the oxidation state of iodine in  $H_5IO_6$ ?

A. 9

B. 5

C. 7

D. 2

**Answer: C**



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**43.** The ultimate products oxidation of most of hydrogen and carbon in food stuffs are

A.  $H_2O$  alone

B.  $CO_2$  alone

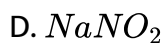
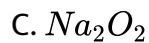
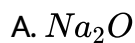
C.  $H_2O$  and  $CO_2$

D. None of these

**Answer: C**

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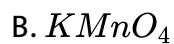
**44.** Which of the following substances acts as an oxidising as well as a reducing agent?



**Answer: D**

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**45.** The oxidant which is used as an antiseptic is



**Answer: B**

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**46.** What is the oxidising agent in chlorine water ?



D. None of these

**Answer: C**





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47. In organic reactions, metallic lithium in liquid ammonia behaves as

- A. Oxidising agent
- B. Reducing agent
- C. Bleaching agent
- D. Dehydrating agent

Answer: B



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48. In the reaction

$HAsO_2 + Sn^{2+} \rightarrow As + Sn^{4+} + H_2O$  oxidising agent is

- A.  $Sn^{2+}$
- B.  $Sn^{4+}$

C.  $As$

D.  $HAsO_2$

**Answer: D**

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**49.** Consider the following statements :

In the chemical reaction

(1) Manganese ion is oxidised (2) Manganese ion is reduced

(3) Chloride ion is oxidised (4) Chloride ion is reduced

which of these statements are correct

A. 1 and 3

B. 1 and 4

C. 2 and 3

D. 2 and 4



**Answer: C**

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**50.** When  $NaCl$  is dissolved in water the sodium ion becomes

- A. Oxidised
- B. Reduced
- C. Hdrolysed
- D. Hydrated

**Answer: D**

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**51.** Assertion (A):  $SO_2$  and  $Cl_2$  are both bleaching agents.

Reason (R ): Both are reducing agents.

- A. If both assertion and reason are true and the reason is the correct explanation of the assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of the assertion.
- C. If assertion is true but reason is false.
- D. If the assertion and reason both are false.

**Answer: C**



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**52.** Assertion: Stannous chloride is a powerful oxidising agent which oxidises mercuric chloride to mercury

Reason: Stannous chloride gives grey precipitate with mercuric chloride, but stannic chloride does not do so.

- A. If both assertion and reason are true and the reason is the correct explanation of the assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of the assertion.
- C. If assertion is true but reason is false.
- D. If assertion is false but reason is true.

**Answer: D**

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53. Assertion : In a reaction

$Zn_{(s)} + CuSO_{4(aq)} \rightarrow ZnSO_{4(aq)} + Cu_{(s)}$ ,  $Zn$  is a reductant but itself get oxidized.

Reason : In a redox reaction, oxidant is reduced by accepting electrons and reductant is oxidized by losing electrons.

- A. If both assertion and reason are true and the reason is the correct explanation of the assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of the assertion.
- C. If assertion is true but reason is false.
- D. If the assertion and reason both are false.

**Answer: A**

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**54.** Statement 1 :  $H_2SO_4$  cannot act as reducing agent.

Statement 2 : Sulphur cannot increase its oxidation number beyond +6.

- A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

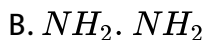
**Answer: A**

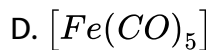


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## Ordinary Thinking (Objective Questions) Oxidation number and Oxidation state

1. In which of the following compounds transition metal has zero oxidation state ?





**Answer: D**

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2. The oxidation state of Fe in  $Fe_3O_4$  is :

A.  $\frac{3}{2}$

B.  $\frac{4}{5}$

C.  $\frac{5}{4}$

D.  $\frac{8}{3}$

**Answer: D**

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3. When  $KMnO_4$  is reduced with oxalic acid in acidic solution, the oxidation number of  $Mn$  changes from

A. 7 to 4

B. 6 to 4

C. 7 to 2

D. 4 to 2

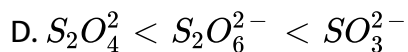
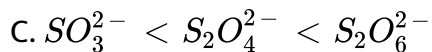
Answer: C

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4. The oxidation states of sulphur in the anions  $SO_3^{2-}$ ,  $S_2O_4^{2-}$ , and  $S_2O_6^{2-}$  follow the order

A.  $S_2O_6^{2-} < S_2O_4^{2-} < SO_3^{2-}$

B.  $S_2O_4^{2-} < SO_3^{2-} < S_2O_6^{2-}$



**Answer: B**

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5. Oxidation numbers of P in  $PO_4^{3-}$ , of S in  $SO_4^{2-}$ , and that of Cr in  $Cr_2O_7^{2-}$  are respectively,

A. +5, +6 and +6

B. +3, +6 and +5

C. +5, +3 and +6

D. -3, +6 and +6

**Answer: A**

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6. Oxidation no. of  $P$  in  $H_4P_2O_5$ ,  $H_4P_2O_6$ , and  $H_4P_2O_7$  are respectively

A. +3, +4, +5

B. +3, +5, +4

C. +5, +3, +4

D. +5, +4, +3

**Answer: A**

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7. When  $Cl_2$  gas reacts with hot and concentrated sodium hydroxide solution, the oxidation number of chlorine changes from

A. Zero to +1 and Zero to -5

B. Zero to -1 and Zero to +5

C. Zero to -1 and Zero to +3

D. Zero to +1 and Zero to -3

**Answer: B**

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8. In which of the following compounds nitrogen exhibits highest oxidation state

A.  $N_2H_4$

B.  $NH_3$

C.  $N_3H$

D.  $NH_2OH$

**Answer: C**

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9. A mixture of potassium chlorate, oxalic acid and sulphuric acid is heated. During the reaction which element undergoes maximum change in the oxidation number?

A. S

B. H

C. Cl

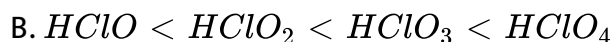
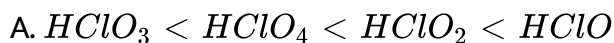
D. C

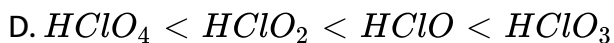
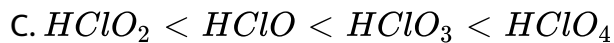
Answer: C



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10. Among the following, the correct order of acidity is:

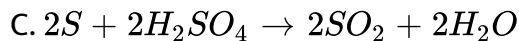
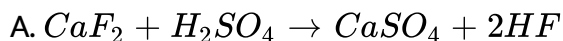




**Answer: B**

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11. Hot concentrated sulphuric acid is a moderately strong oxidizing agent. Which of the following reaction does not show oxidizing behaviour?



**Answer: A**

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12. Oxidation number of nickel in  $Ni(CI)_4$

A. 0

B. +4

C. -4

D. +2

**Answer: A**



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13. The oxidation state of sulphur in  $Na_2S_4O_6$  is

A.  $\frac{2}{3}$

B.  $\frac{3}{2}$

C.  $\frac{3}{5}$

D.  $\frac{5}{2}$

**Answer: D**

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**14.** Oxidation number of osmium (*Os*) in  $OsO_4$  is

A. +4

B. +6

C. +7

D. +8

**Answer: D**

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15.  $HNO_2$  acts both as reductant and as oxidant, while  $HNO_3$  acts only as oxidant. It is due to their

- A. Solubility ability
- B. Maximum oxidation number
- C. Minimum oxidation number
- D. Minimum number of valence electrons

**Answer: B**

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16. Oxidation number of fluorine in  $F_2O$  is:

- A.  $-1$
- B.  $+1$
- C.  $+2$

D.  $-2$

**Answer: A**



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17. The oxidation number of  $Cr$  in  $K_2Cr_2O_7$  is

A.  $+6$

B.  $-7$

C.  $+2$

D.  $-2$

**Answer: A**



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18. When sodium reacts with excess of oxygen, oxidation number of oxygen changes from

- A. 0
- B. 0 – 1
- C. 1
- D. 0-2

**Answer: B**

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19. If  $HNO_3$  changes into  $N_2O$ , the oxidation number is changed by

- A. +2
- B. – 1
- C. 0

D. +4

**Answer: D**

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20. What is the oxidation number of *Co* in  $[Co(NH_3)_4ClNO_2]$ ?

A. +2

B. +3

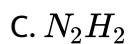
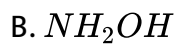
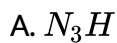
C. +4

D. +5

**Answer: A**

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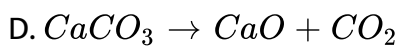
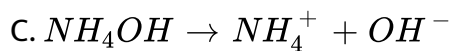
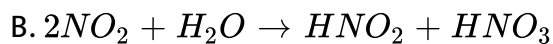
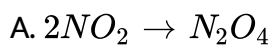
21. The oxidation state of nitrogen is highest in



**Answer: A**

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**22.** In which reaction there is a change in valency



**Answer: B**





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23. When  $SO_2$  is passed through acidic solution of potassium dichromate, then chromium sulphate is formed. Change in valency of chromium is

A. +4 to +2

B. +5 to +3

C. +6 to +3

D. +7 to +2

Answer: C



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24. The oxidation state of  $M^{3+}$  after removing three electrons is

A. Zero

B. +3

C. +6

D. -6

**Answer: C**



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**25.** Oxidation number of iodine varies from -

A. -1 to +1

B. -1 to +7

C. +3 to +5

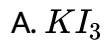
D. -1 to +5

**Answer: B**



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26. Which one of the following has the highest oxidation number of iodine?



Answer: D



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27. The charge on cobalt in  $[Co(CN)_6]^{-3}$  is -

A.  $-6$

B.  $-3$

C.  $+3$

D. +6

**Answer: C**

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**28.** Oxidation state of oxygen in hydrogen peroxide is

A. -1

B. +1

C. 0

D. -2

**Answer: A**

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**29.** The oxidation number of  $P$  in  $Mg_2P_2O_7$  is

A. +3

B. +2

C. +5

D. -3

**Answer: C**



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**30.** The atomic number of an element which can not show the oxidation state of +3 is-

A. 13

B. 32

C. 33

D. 17



**Answer: A**



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**31.** The oxidation number of  $S$  in  $Na_2S_4O_6$  is

A.  $-2$

B.  $+2$

C.  $-6$

D.  $+6$

**Answer: D**



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**32.** Oxidation number of  $N$  in  $(NH_4)_2SO_4$  is

A.  $-1/3$

B.  $-1$

C.  $+1$

D.  $-3$

**Answer: D**



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**33.** The oxidation number of sulphur in  $H_2SO_4$ ,  $H_2S_2O_4$  and  $H_2S_2O_6$  are respectively

A.  $+3$ ,  $+4$ ,  $+5$

B.  $+5$ ,  $+4$ ,  $+3$

C.  $+6$ ,  $+3$ ,  $+5$

D.  $+3$ ,  $+5$ ,  $+4$

**Answer: C**



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34. Which of the following statement is correct

- A. Hydrogen has oxidation number -1 and +1
- B. Hydrogen has same electronegativity as halogens
- C. Hydrogen will not be liberated at anode
- D. Hydrogen has same ionization potential as alkali metals

Answer: A

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35. The oxidation number of carbon in  $CH_2Cl_2$  is

- A. 0
- B. +2
- C. -2

D. +4

**Answer: A**

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**36.** Oxidation number of nitrogen in  $NaNO_2$  is

A. +2

B. +3

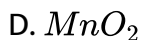
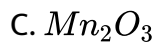
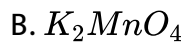
C. +4

D. -3

**Answer: B**

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**37.** The highest oxidation state of  $Mn$  is shown by

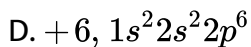
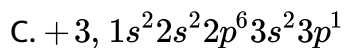
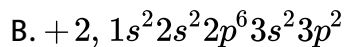
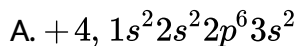


**Answer: A**



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**38.** The oxidation number and the electronic configuration of sulphur in  $H_2SO_4$  is



**Answer: D**

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**39.** Oxidation number of  $N$  in  $NH_3$  is

A.  $-3$

B.  $+3$

C.  $0$

D.  $+5$

**Answer: A**

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**40.** Nitrogen shows different oxidation states in the range:

A.  $0$  to  $+5$

B. +3, +5, +7, 0

C. +5, +7, -1, 0

D. -1, -5, -1, 0

**Answer: B**

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41. Oxidation number of iodine in  $IO_3^-$ ,  $IO_4^-$ ,  $KI$  and  $I_2$  respectively are

A. -1, -1, 0, +1

B. +3, +5, +7, 0

C. +5, +7, -1, 0

D. -1, -5, -1, 0

**Answer: C**

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42. Oxidation state of phosphorus in cyclotrimetaphosphoric acid is

A. +3

B. +5

C. -3

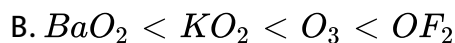
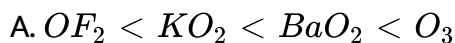
D. +2

Answer: B

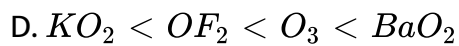
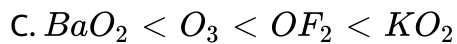


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43. In which of the following the oxidation number of oxygen has been arranged in increasing order :-



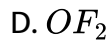
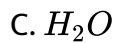
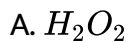




**Answer: B**

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**44.** Oxygen has an oxidation state of +2 in



**Answer: D**

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45. The sum of the oxidation states of all the carbon atoms present in the compound  $C_6H_5CHO$  is :

A. +2

B. 0

C. +4

D. -4

**Answer: D**



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46. Oxidation state of chlorine in perchloric acid is

A. -1

B. 0

C. -7

D. +7

Answer: D



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47. In the conversion fo  $Br_2$  to  $BrO_3^-$  , the oxidation state of  $Br$  changes from.

A.  $-1$  to  $-1$

B.  $0$  to  $-1$

C.  $0$  to  $+5$

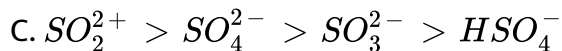
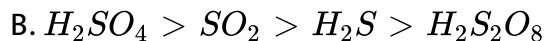
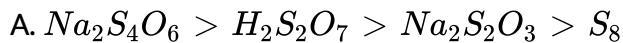
D.  $0$  to  $-5$

Answer: C



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48. Which of the following have been arranged in the decreasing order of oxidation number of sulphur ?



Answer: D



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49. Chlorine is in +3 oxidation state in



D.  $ClF_3$

**Answer: D**

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50. In the chemical reaction  $Cl_2 + H_2S \rightarrow 2HCl + S$ , the oxidation number of sulphur changes from

A. 0 to 2

B. 2 to 0

C. -2 to 0

D. -2 to -1

**Answer: C**

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51. Oxidation number of oxygen in ozone

A. +3

B. -3

C. -2

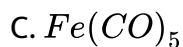
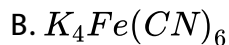
D. 0

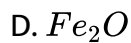
Answer: D



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52. In which of the following compounds iron has lowest oxidation state?

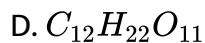
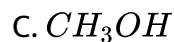




**Answer: C**

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**53.** In which of the following compounds the oxidation number of carbon is maximum



**Answer: B**

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54. the oxidation number of C in  $CO_2$  is

A.  $-2$

B.  $+2$

C.  $-4$

D.  $+4$

Answer: D



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55. In  $XeO_3$  and  $XeF_6$  the oxidation state of  $Xe$  is

A.  $+4$

B.  $+6$

C.  $+1$

D.  $+3$



**Answer: B**



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**56.** Calculate the oxidation number of S in  $SO_4^{2-}$  ion.

A. +6

B. +3

C. +2

D. -2

**Answer: A**



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**57.** The oxidation number of phosphorus in  $Ba(H_2PO_2)_2$  is:-

A. -1

B. +1

C. +2

D. +3

**Answer: B**

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**58.** Phosphorus has the oxidation state +3 in

A. Orthophosphoric acid

B. Phosphorus acid

C. Metaphosphoric acid

D. Pyrophosphoric acid

**Answer: B**

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59. The oxidation state of Cr in  $CrO_5$  is

A. 3

B. 4

C. 6

D. 7

Answer: C



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60. Oxidation number of sulphur in  $Na_2S_2O_3$  is

A. +1

B. +2

C. +3

D. -3

**Answer: B**

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**61.** The oxidation state of chromium in the final product formed by the reaction between KI and acidified potassium dichromate solution is :

A. +4

B. +6

C. +2

D. +3

**Answer: D**

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**62.** The oxidation state of *Cr* in  $[Cr(NH_3)_4Cl_2]^+$  is:

A. +3

B. +2

C. +1

D. 0

**Answer: A**



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**63.** The oxidation number of oxygen in  $KO_3$ ,  $Na_2O_2$  respectively are:

A. 3, 2

B. 1, 0

C. 0, 1

D. -0.33, -1

**Answer: D**



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64. Oxidation state of oxygen atom in potassium superoxide is

A. 0

B.  $-1$

C.  $-\frac{1}{2}$

D.  $-2$

Answer: C

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65. The oxidation number of nitrogen in  $(N_2H_5)^+$  is

A.  $-3$

B.  $(-2)$

C.  $-1$

D.  $+2$

**Answer: B**

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66. The oxidation number of Ba in barium peroxide is

A.  $+6$

B.  $+2$

C.  $1$

D.  $+4$

**Answer: B**

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67. Carbon has zero oxidation number in



**Answer: C**



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68. The oxidation state shown by silicon when it combines with strongly electropositive metals is





**Answer: B**

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**69.** A compound is in its high oxidation state. Then its will be

- A. Highly acidic
- B. Highly basic
- C. Highest oxidising property
- D. Half acidic, half basic

**Answer: C**

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**70.** Oxidation numbers of two *Cl* atoms in bleaching powder,  $CaOCl_2$ , are

A.  $-1, -1$

B.  $+1, -1$

C.  $+1, +1$

D.  $0, -1$

**Answer: B**



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**71.** In chromite ore, the oxidation number of iron and chromium are respectively.

A.  $+3, +2$

B.  $+3, +6$

C.  $+2, +6$

D.  $+2, +3$

**Answer: D**



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72. When a mananous salt is fused with a mixture of  $KNO_3$  and and solid NaOH, the oxidation number of Mn change from +2 to:

A. +4

B. +3

C. +6

D. +7

**Answer: C**



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73. Consider the following reaction  $6NaOH + 3Cl_2 \rightarrow 5NaCl + A + 3H_2O$ . What is the oxidation number of chlorine in "A" ?

A. +5

B. -1

C. +3

D. +1

**Answer: A**



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74. The oxidation state of iodine in  $IPO_4$  is

A. +1

B. +3

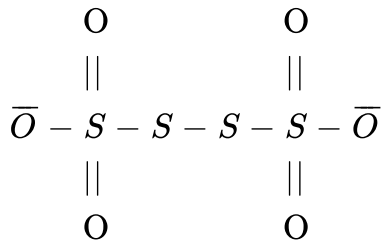
C. +5

D. +7

**Answer: B**

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75. The oxidation states of S atoms in  $S_2O_6^{2-}$  from left to right respectively are



A. +6, 0, 0, +6

B. +3, +1, +1, +3

C. +5, 0, 0, +5

D. +4, +1, +1, +4

**Answer: A**



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**76.** The oxidation state of nickel in  $K_4Ni(CN)_4$  is:

A.  $-2$

B.  $-1$

C.  $+2$

D.  $0$

**Answer: D**



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**77.** The oxidation state of nitrogen in  $N_3H$  is

A.  $+\frac{1}{3}$

B. +3

C. -1

D.  $-\frac{1}{3}$

**Answer: D**

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**78.** The oxidation number and covalency of sulphur in the sulphur molecule ( $S_8$ ) are respectively:

A. 0 and 2

B. 6 and 8

C. 0 and 8

D. 6 and 2

**Answer: A**

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79. Oxidation number of  $N$  in  $NH_3$  is

A. +5

B. +3

C. -5

D. -3

Answer: D



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80. Assertion: Fluorine exists only in  $-1$  oxidation state.

Reason: Fluorine has  $2s^2 2p^5$  configuration.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.



B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

**Answer: B**

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**81.** Assertion:  $HClO_4$  is a stronger acid than  $HClO_3$ .

Reason: Oxidation state of  $Cl$  in  $HClO_4$  is  $+VII$  and in  $HClO_3$  is  $+V$ .

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

**Answer: B**

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**82.** Assertion :- Oxidation number of carbon in  $CH_2O$  is zero.

Reason :-  $CH_2O$  (formaldehyde) is a covalent compound.

- A. If both assertion and reason are true and the reason is the correct explanation of the assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of the assertion.
- C. If assertion is true but reason is false.
- D. If the assertion and reason both are false.

**Answer: B**

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**83.** Assertion : The oxidation numbers are artificial, they are useful as a book keeping device of elements in reactions

Reason : The oxidation numbers do not usually represent real charge on atoms, they are simply conventions that indicate what the maximum charge could possibly be on an atom in a molecule.

- A. If both assertion and reason are true and the reason is the correct explanation of the assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of the assertion.
- C. If assertion is true but reason is false.
- D. If the assertion and reason both are false.

**Answer: A**



## Ordinary Thinking (Objective Questions) Redox reaction and Method for balancing Redox reaction

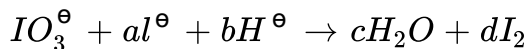
1. The number of moles of  $KMnO_4$  reduced by 1mol of  $KI$  in alkaline medium is

- A. One fifth
- B. Five
- C. One
- D. Two

**Answer: D**

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2. In the balanced chemical reaction



$a$ ,  $b$ ,  $c$ , and  $d$ , respectively, correspond to

A. 5, 6, 3, 3

B. 5, 3, 6, 3

C. 3, 5, 3, 6

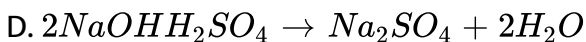
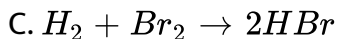
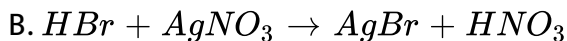
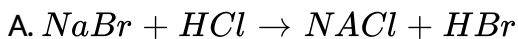
D. 5, 6, 5, 5

**Answer: A**



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3. Which of the following reaction involves oxidation reduction?



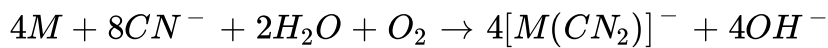
**Answer: C**





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4. In the equation



The metal M is

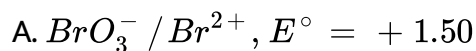
- A. Copper
- B. Iron
- C. Gold
- D. Zinc

Answer: C



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5. Which of the following is the strongest oxidising agent?



B.  $Fe^{3+} / Fe^{2+}, E^\circ = + 0.76$

C.  $MnO_4^- / Mn^{2+}, E^\circ = + 1.52$

D.  $Cr_2O_7^{2-} / Cr^{3+}, E^\circ = + 1.33$

**Answer: C**

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6.  $MnO_4^-$  ions are reduced in acidic conditions to  $Mn^{2+}$  ions whereas they are reduced in neutral condition to  $MnO_2$ . The oxidation of 25 mL of a solution  $x$  containing  $Fe^{2+}$  ions required in acidic condition 20 mL of a solution  $y$  containing  $MnO_4^-$  ions. What value of solution  $y$  would be required to oxidize 25 mL of solution  $x$  containing  $Fe^{2+}$  ions in neutral condition ?

A. 11.4 ml

B. 12.0 ml

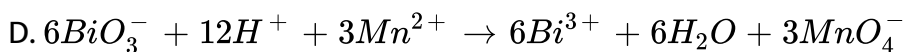
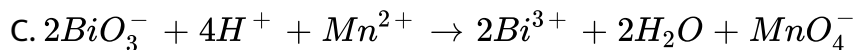
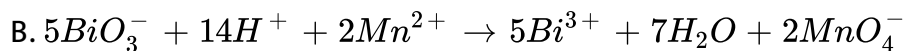
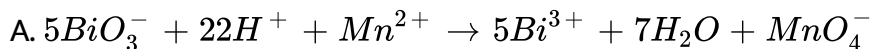
C. 33.3 ml

D. 35.0 ml

Answer: B

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7. Which of the following equations is a balanced one?



Answer: B

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8. Number of electron involved in the reduction of  $Cr_2O_7^{2-}$  ion in acidic solution to  $Cr^{3+}$  is:

A. 0

B. 2

C. 3

D. 5

**Answer: C**

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9. Number of moles of  $K_2Cr_2O_7$  can be reduced by 1 mole of  $Sn^{2+}$  ions is:

A.  $1/3$

B.  $1/6$

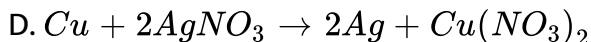
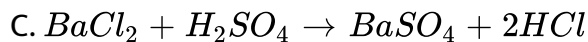
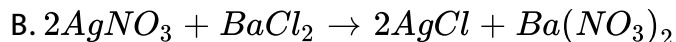
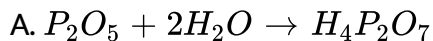
C. 2/3

D. 1

**Answer: A**

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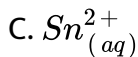
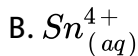
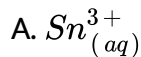
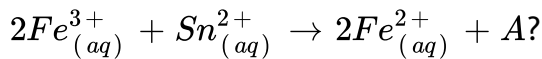
**10. Which of the following reaction is a redox reaction?**



**Answer: D**

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11. What is 'A' in the following reaction

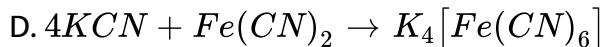
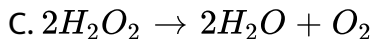
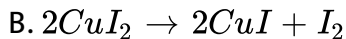
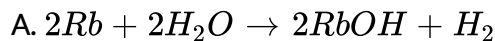


Answer: B



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12. Which of the following is not a redox reaction



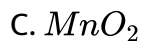
Answer: D



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13.  $2MnO_4^- + 5H_2O_2 + 6H^+ \rightarrow 2Z + 5O_2 + 8H_2O$ . In this reaction

Z is



Answer: A



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14. When  $KMnO_4$  acts as an oxidising agent and ultimately forms  $MnO_4^{2-}$ ,  $MnO_2$ ,  $Mn_2O_3$ , and  $Mn^{2+}$ , then the number of electrons transferred in each case, respectively, are

A. 4,3,1,5

B. 1,5,3,7

C. 1,3,4,5

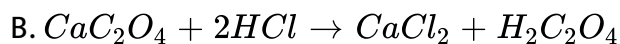
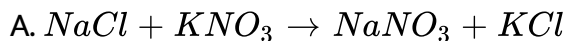
D. 3,5,7,1

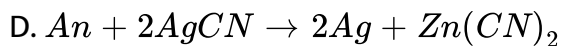
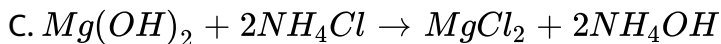
Answer: C



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15. which of the following is a redox reaction





**Answer: D**



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**16.** Stannous sulphate ( $SnSO_4$ ) and potassium permanganate are used as oxidising agents in acidic medium for oxidation of ferrous ammonium sulphate to ferric sulphate. The ration of number of moles of stannous sulphate required per mole of ferrous ammonium sulphate to the number of moles of  $KMnO_4$  required per mole of ferrous ammonium sulphate, is:

A. 5.0

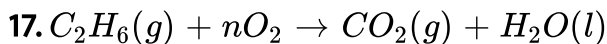
B. 0.2

C. 0.6

D. 2.5

**Answer: D**

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In this equation, the ratio of the coefficients of  $CO_2$  and  $H_2O$  is

A. 1 : 1

B. 2 : 3

C. 3 : 2

D. 1 : 3

**Answer: B**

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18. In the redox reaction,  
 $xKMnO_4 + NH_3 \rightarrow yKNO_3 + MnO_2 + MnO_2 + KOH + H_2O$ ,  $x$   
and  $y$  are

A.  $x = 4, y = 6$

B.  $x = 3, y = 8$

C.  $x = 8, y = 6$

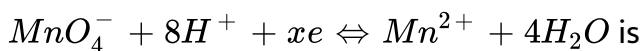
D.  $x = 8, y = 3$

Answer: D



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19. The value of  $x$  in the partial redox equation



A. 5



B. 3

C. 1

D. 0

**Answer: A**



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**20.** Starch iodide paper is used to test for the presence of

A. Iodine

B. Oxidising agent

C. Iodine ion

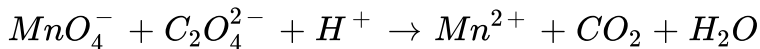
D. Reducing agent

**Answer: B**



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21. For the redox reaction,



the correct coefficients of the reactants for the balanced reaction are

- A.  $\text{MnO}_4^-$     $\text{C}_2\text{O}_4^{2-}$     $\text{H}^+$   
16            5            2
- B.  $\text{MnO}_4^-$     $\text{C}_2\text{O}_4^{2-}$     $\text{H}^+$   
2            5            16
- C.  $\text{MnO}_4^-$     $\text{C}_2\text{O}_4^{2-}$     $\text{H}^+$   
2            16            5
- D.  $\text{MnO}_4^-$     $\text{C}_2\text{O}_4^{2-}$     $\text{H}^+$   
5            16            2

Answer: B



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## Critical Thinking

1. One litre hard water contains 12.00 mg  $\text{Mg}^{2+}$  milliequivalent of washing soda required to remove its hardness is

A. 1

B. 12.15

C.  $1 \times 10^{-3}$

D.  $12.15 \times 10^{-3}$

**Answer: A**



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2. The molar heat capacity of water at constant pressure,  $C_p$ , is  $75 \text{ JK}^{-1} \text{ mol}^{-1}$ . When 1.0 kJ of heat is supplied to 100 g water which is free to expand, the increase in temperature of water is :

A. 6.6 K

B. 1.2 K

C. 2.4 K

D. 4.8 K

**Answer: C**



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3. A compound possesses 8% sulphur by mass. The least molecular mass is?

A. 200

B. 400

C. 155

D. 355

**Answer: B**



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4. In a mole of water vapours at STP, the volume actually occupied or taken by the molecules (i.e., Avogadro's No.  $\times$  volume of one molecule) is

- A. Zero
- B. Less than 1% of 22.4 litres
- C. About 10% of the volume of container
- D. 1% to 2% of 22.4 litres

**Answer: B**



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5. Complete combustion of 0.858 g of compound X gives 2.63 g of  $CO_2$  and 1.28 g of  $H_2O$ . The lowest molecular mass X can have

- A. 43 g

B. 86 g

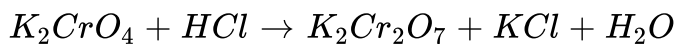
C. 129 g

D. 172 g

**Answer: A**

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6. The set of numerical coefficients that balances the chemical equation



A. 1,1,2,2,1

B. 2,2,1,1,1

C. 2,1,1,2,1

D. 2,2,1,2,1

**Answer: D**

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7. Mixture of sand and sulphur may best be separated by

- A. Fractional crystallisation from aqueous solution
- B. Magnetic method
- C. Fractional distillation
- D. Dissolving in  $CS_2$  and filtering

**Answer: B**

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8. How much time would it take to distribute one Avogadro number of wheat grains, if  $10^{10}$  grains are distributed each second?

- A. 0.1673
- B. 1.673

C. 16.73

D. 167.3

**Answer: B**

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9. A 100% pure sample of a divalent metal carbonate weighing 2 g on complete thermal decomposition releases 448 cc of carbon dioxide at STP. The equivalent mass of the metal is

A. 40

B. 20

C. 28

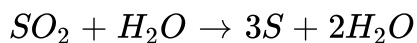
D. 12

**Answer: A**

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10. In the following reaction, which choice has value twice that of the equivalent mass of the oxidising agent



A. 64

B. 32

C. 16

D. 48

**Answer: B**



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11. What volume of hydrogen gas at 273 K and 1 atm. Pressure will be consumed in obtaining 21.6 g elemental boron (Atomic mass=10.8) from the reduction of boron trichloride by hydrogen?

A. 22.4 L

B. 89.6 L

C. 67.2 L

D. 44.8 L

**Answer: C**

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12. A mixture of  $CaCl_2$  and NaCl weighing 4.44 is treated with sodium carbonate solution to precipitate all the  $Ca^{2+}$  ions as calcium carbonate. The calcium carbonate so obtained is heated strongly to get 0.56 g of  $CaO$ . The percentage of NaCl in the mixture of (atomic mass of Ca=40) is

A. 75

B. 30.5

C. 25

D. 69.4

**Answer: A**



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**13.** The volume of 0.1M oxalic acid that can be completely oxidised by 20mL of 0.025M  $KMnO_4$  solution is

A. 125 mL

B. 25 mL

C. 12.5 mL

D. 37.5 mL

**Answer: C**



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1. White  $P$  reacts with caustic soda, the products are  $PH_3$  and  $NaH_2PO_2$ . This reaction is an example of:

- A. Oxidation
- B. Reduction
- C. Oxidation and reduction (Redox)
- D. Neutralization

**Answer: C**

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2. One mole of  $N_2H_4$  loses ten moles of electrons to form a new compound  $A$ . Assuming that all the nitrogen appears in the new compound, what is the oxidation state of nitrogen in  $A$ ? (There is no change in the oxidation state of hydrogen.)

A. +3

B. -3

C. -1

D. +5

**Answer: A**



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3. If 0.50 mol of  $BaCl_2$  is mixed with 0.20 mol of  $Na_3PO_4$ , the maximum number of moles of  $Ba_3(PO_4)_2$  that can be formed is

A. 0.70

B. 0.50

C. 0.20

D. 0.10

Answer: D

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4. HBr and HI can reduce sulphuric acid, HCl can reduced  $KMnO_4$  and HF can reduce.....

A.  $H_2SO_4$

B.  $KMnO_4$

C.  $K_2Cr_2O_7$

D. None of the above

Answer: D

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5. The oxidation number of carbon in  $CH_2O$  is.

A.  $-2$

B.  $+2$

C.  $0$

D.  $+4$

**Answer: C**



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6. If  $10^{21}$  molecules are removed from 200 mg of  $CO_2$ , the number of moles of  $CO_2$  left will be ?

A.  $2.85 \times 10^{-3}$

B.  $28.8 \times 10^{-3}$

C.  $0.288 \times 10^{-3}$

D.  $1.68 \times 10^{-2}$

**Answer: A**



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7. The brown ring complex compound is formulated as

$[Fe(H_2O)_5NO]SO_4$ . The oxidation state of  $Fe$  is

A. 1

B. 2

C. 3

D. 0

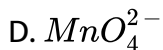
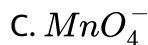
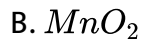
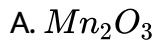
**Answer: A**



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8. The equivalent weight of  $MnSO_4$  is half its molecular weight when it is converted to



**Answer: B**



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9. In which mode of expression, the concentration of a solution remains independent of temperature?

A. Molarity

B. Normality

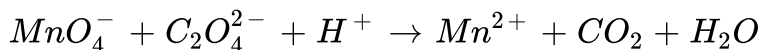
C. Formality

D. Molality

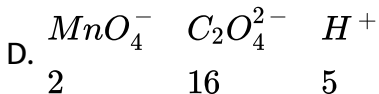
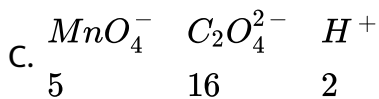
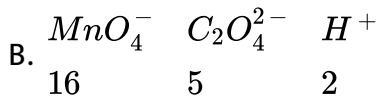
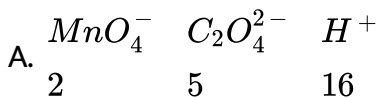
Answer: D

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10. For the redox reaction,



the correct coefficients of the reactants for the balanced reaction are



Answer: A

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11. The oxidation number of phosphorus in  $Ba(H_2PO_2)_2$  is:-

A. +3

B. +2

C. +1

D. -1

**Answer: C**



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12. The sulphate of a metal  $M$  contains 9.87% of  $M$ , This sulphate is isomorphous with  $ZnSO_4 \cdot 7H_2O$ . The atomic weight of  $M$  is

A. 40.3

B. 36.3

C. 24.3

D. 11.3

**Answer: C**

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13. The weight of  $1 \times 10^{22}$  molecules of  $CuSO_4 \cdot 5H_2O$  is

A. 41.59 g

B. 415.9 g

C. 4.159 g

D. None of these

**Answer: C**

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14. The oxidation states of the most electronegative element in the products of the reaction between  $BaO_2$  with dilute  $H_2SO_4$  are

- A. 0 and -1
- B. -1 and -2
- C. -2 and 0
- D. -2 and +1

**Answer: B**



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15. The compound which could not act both as oxidising and reducing agent is

- A.  $SO_2$
- B.  $MnO_2$
- C.  $Al_2O_3$

D.  $CrO$

**Answer: C**

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**16.** The law of multiple proportion was proposed by

A. Lavoisier

B. Dalton

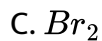
C. Proust

D. Gay-Lussac

**Answer: B**

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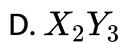
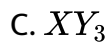
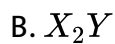
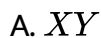
**17.** Which of the following is the most powerful oxidizing agent?



**Answer: A**

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**18.** The simplest formula of a compound containing 50% of element X (atomic mass 10) and 50% of element Y (atomic mass 20) is



**Answer: B**



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19. The compound  $Yb_a_2Cu_3O_7$  which shows super conductivity has copper in oxidation state \_\_\_\_\_. Assume that the rare earth element yttrium is in its usual +3 oxidation state.

A. 3/7

B. 7/3

C. 3

D. 7

**Answer: B**



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20. Which has the most stable +2 oxidation state ?

A. *Ag*

B. *Fe*

C. *Sn*

D. *Pb*

Answer: D



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21. The number of moles of  $KMnO_4$  that will be needed to react completely with one mole of ferrous oxalate in acidic solution is:

A.  $\frac{3}{5}$

B.  $\frac{2}{5}$

C.  $\frac{4}{5}$

D. 1

**Answer: A**

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22. The normality of  $0.3M$  phosphorus acid ( $H_3PO_3$ ) is

A. 0.1

B. 0.9

C. 0.3

D. 0.6

**Answer: D**

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23. The oxidation number of sulphur in  $S_8$ ,  $S_2F_2$  and  $H_2S$  respectively are:

A. 0, +1 and -2

B. +2, +1 and -2

C. 0, +1 and +2

D. -2, +1 and -2

**Answer: A**

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24. One mole of calcium phosphide on reaction with excess water gives

A. 1 mole of phosphine

B. 2 moles of phosphoric acid

C. 2 moles of phosphine

D. 1 mole of phosphorus pentaoxide

**Answer: C**

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25. The oxidation number of sulphur in  $S_8$ ,  $S_2F_2$  and  $H_2S$  respectively are:

A. 0, +1 and -2

B. +2, +1 and -2

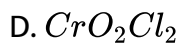
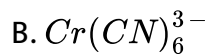
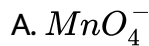
C. 0, +1 and +2

D. -2, +1 and -2

**Answer: A**

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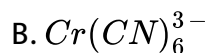
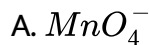
26. Among the following identify the species with an atom in +6 oxidation state.

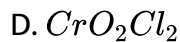


Answer: D

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27. Among the following, identify the species with an atom in +6 oxidation state.





**Answer: D**

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28. The reaction  $3ClO^-(aq) \rightarrow ClO_3^-(aq) + 2Cl^-(aq)$  an example of

:

- A. Oxidation reaction
- B. Reduction reaction
- C. Disproportionation reaction
- D. Decomposition reaction

**Answer: C**

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29. An aqueous solution of 6.3g oxalic acid dihydrate is made up to 250mL. The volume of 0.1N NaOH required to completely neutralise 10mL of this solution is

- A. 40 ml.
- B. 20 ml.
- C. 10 ml.
- D. 4 ml.

**Answer: A**



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30. In the standardization of  $Na_2S_2O_3$  using  $K_2Cr_2O_7$  by iodometry, the equivalent weight of  $K_2Cr_2O_7$  is

- A. (Molecular weight) / 2

B. (Molecular weight) / 6

C. (Molecular weight) / 3

D. Same as molecular weight

**Answer: B**

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**31.** How many moles of electrons weigh one kilogram?

A.  $6.023 \times 10^{23}$

B.  $\frac{1}{9.108} \times 10^{31}$

C.  $\frac{6.023}{9.108} \times 10^{54}$

D.  $\frac{1}{9.108 \times 6.023} \times 10^8$

**Answer: D**

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32. A mixture  $x$  containing 0.02 mol of  $[Co(NH_3)_5SO_4]Br$  and 0.02 mol of  $[Co(NH_3)_5Br]SO_4$  was prepared in 2L of solution.

1L of mixture  $X + \text{excess } AgNO_3 \rightarrow Y$

1L of mixture  $X + \text{excess } BaCl_2 \rightarrow Z$

The number of moles of  $Y$  and  $Z$  are

A. 0.01, 0.01

B. 0.02, 0.01

C. 0.01, 0.02

D. 0.02, 0.02

Answer: A

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33. For  $H_3PO_3$  and  $H_3PO_4$  the correct choice is

A.  $H_2PO_3$  is dibasic and resucing

B.  $H_3PO_3$  is dibasic and non-reducing

C.  $H_3PO_4$  is tribasic and reducing

D.  $H_3PO_3$  is tribasic and non-reducing

**Answer: A**

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**34.** When  $MnO_2$  is fused with  $KOH$ , a coloured compound is formed, the product and its colour is:

A.  $K_2MnO_4$ , purple green

B.  $KMnO_4$ , purple

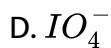
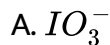
C.  $Mn_2O_3$ , brown

D.  $Mn_3O_4$  black

**Answer: A**

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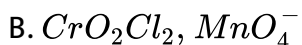
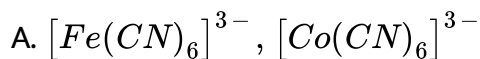
35. The product of oxidation of  $I^-$  with  $MnO_4^-$  in alkaline medium is



Answer: A

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36. The pair of the compounds in which both the metals are in the highest possible oxidation state is



C.  $TiO_3$ ,  $MnO_2$

D.  $[Co(CN)_6]^{3-}$ ,  $MnO_3$

**Answer: B**

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37. Consider a titration of potassium dichromate solution with acidified Mohr's salt solution using diphenylamine as indicator. The number of moles of Mohr's salt required per mole of dichromate is:

A. 3

B. 4

C. 5

D. 6

**Answer: D**

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38. Oxidation states of the metal in the minerals haematite and magnetite, respectively, are

A. II, III in haematite and III in magnetite

B. II, III in haematite and II in magnetite

C. II in haematite and II, III in magnetite

D. III in haematite and II, III in magnetite

Answer: D



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39. Which ordering of compounds is according to the decreasing order of the oxidation state of nitrogen ?

A.  $HNO_3$ ,  $NO$ ,  $NH_4Cl$ ,  $N_2$

B.  $HNO_3$ ,  $NO$ ,  $N_2$ ,  $NH_4Cl$

C.  $HNO_3$ ,  $NH_4Cl$ ,  $NO$ ,  $N_2$

D.  $NO$ ,  $HNO_3$ ,  $NH_4Cl$ ,  $N_2$

**Answer: B**



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40. The reaction of white phosphorus with aqueous  $NaOH$  gives phosphine along with another phosphorus containing compound. The reaction type, the oxidation states of phosphorus in phosphine and the other product are respectively:

A. Redox reaction, -3 and -5

B. Redox reaction, +3 and +5

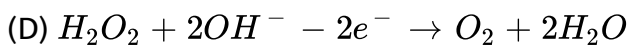
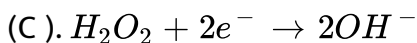
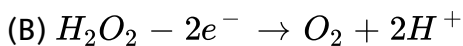
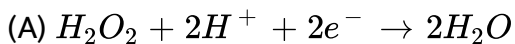
C. Disproportionation reaction, -3 and +5

D. Disproportionation reaction, -3 and +3

Answer: C

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41. In which of the following reactions  $H_2O_2$  acts as reducing agent?



A. (1), (2)

B. (3), (4)

C. (1), (3)

D. (2),(4)

Answer: D

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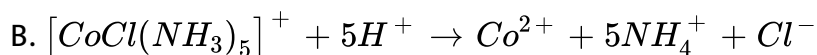
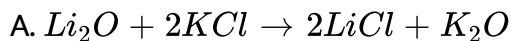
42. The ratio of masses of oxygen and nitrogen in a particular gaseous mixture 1 : 4. The ratio of number of their molecule is :

- A. 1 : 4
- B. 7 : 32
- C. 1 : 8
- D. 3 : 16

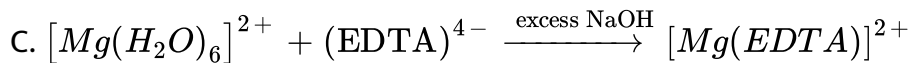
**Answer: B**

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43. The equation which is balanced and represents the correct product(s) is .







**Answer: B**

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44. 1g of a carbonate ( $M_2CO_3$ ) on treatment with excess  $HCl$  produces 0.01186 mole of  $CO_2$ . The molar mass of  $M_2CO_3$  in  $gmol^{-1}$  is

A. 84.3

B. 118.6

C. 11.86

D. 1186

**Answer: A**

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45. The most abundant elements by mass in the body of a healthy human adult are Oxygen (61.4%), Carbon (22.9%), Hydrogen (10.0%), and Nitrogen (2.6%). The weight which a 75 kg person would gain if all  $^1\text{H}$  atoms are replaced by  $^2\text{H}$  atoms is

A. 37.5 kg

B. 7.5 kg

C. 10 kg

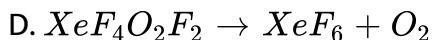
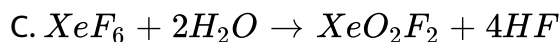
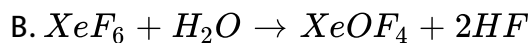
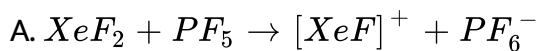
D. 15 kg

**Answer: B**



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46. Which of the following reactions is an example of redox reactions ?

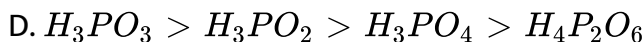
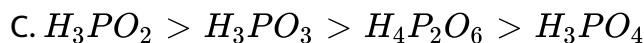
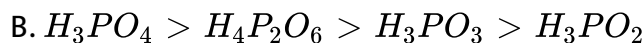
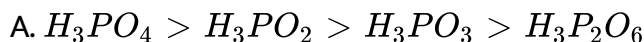


Answer: D



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47. The order of the oxidation state of the phosphorus atom in  $H_3PO_2$ ,  $H_3PO_4$ ,  $H_3PO_3$  and  $H_4P_2O_6$  is



**Answer: B**

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**JEE Section (More than one correct answer)**

1. Reduction of the metal centre in aqueous permanganate ion involves

A.  $3e^-$  in neutral medium

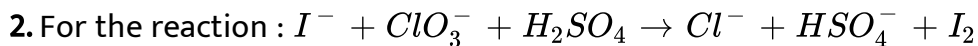
B.  $5e^-$  in neutral medium

C.  $3e^-$  in alkaline medium

D.  $5e^-$  in acidic medium

**Answer: A::D**

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The correct statement(s) in the balanced equation is/are:

A. Stoichiometric coefficient of  $HSO_4^-$  is 6

B. Iodide is oxidized

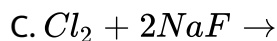
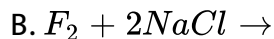
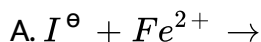
C. Sulphur is reduced

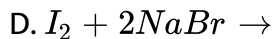
D.  $H_2O$  is one of the products

Answer: A::B::D

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3. No reaction occurs in which of the following equations

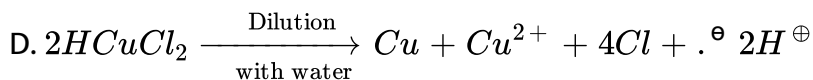
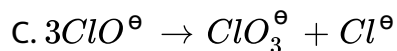
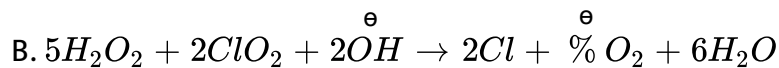
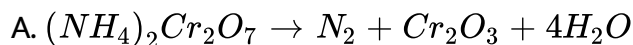




Answer: A::C::D

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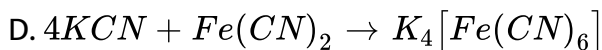
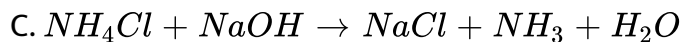
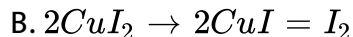
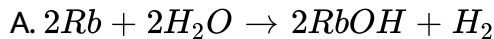
4. Which of the following is / are disproportionation redox changes?



Answer: C::D

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5. Which of the following reactions does not involve oxidation-reduction ?



Answer: C::D

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6. 0.1 mol of  $MnO_4^-$  (in acidic medium) can:

A. Oxidise 0.5 mol of  $Fe^{2+}$

B. Oxidise 0.166 mol of  $FeC_2O_4$

C. Oxidise 0.25 mol of  $C_2O_4^{2-}$

D. Oxidise 0.6 mol of  $Cr_2O_7^{-2}$

**Answer: A::B::C**

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7. When  $(NH_4)_2Cr_2O_7$  is heated

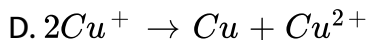
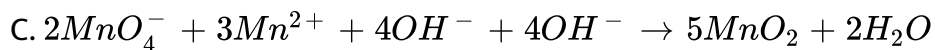
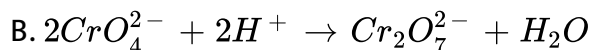
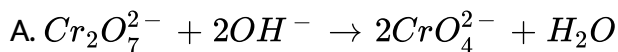
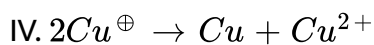
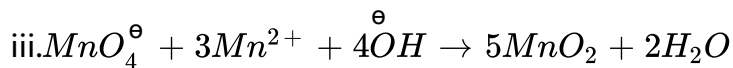
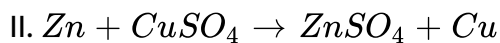
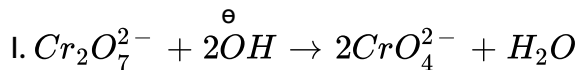
- A. There is oxidation of N
- B. There is reduction of Cr
- C. Net reaction is disproportionation
- D. Net reaction is neutralisation

**Answer: A::B**

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8. which of the following represent redox reactions?



Answer: C::D



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9. A mixture containing one mole of  $BaF_2$  and two mole of  $H_2SO_4$  will be neutralised by:

A. 1 mol of KOH

B. 2 mol of  $Ca(OH)_2$

C. 4 mol of KOH

D. 2 mol of KOH

**Answer: D**



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**10.** A sample of  $H_2O_2$  solution labelled as "28 volume" has density of 265 g/L. Mark the correct option(s) representing concentration of same solution in other units :

A.  $M_{H_2O_2} = 2.5$

B.  $\% \frac{w}{v} = 17$

C. Mole fraction of  $H_2O_2 = 0.2$

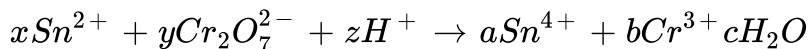
D.  $mm_{H_2O_2} = 13.88$

Answer: A::C::D



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11. In acidic medium dichromate ion oxidizes stannous ion as :



- A. The value of  $x : y$  is 1 : 3
- B. The value of  $x + y + z$  is 18
- C. The value of  $a : b$  is 3 : 2
- D. The value of  $z - c$  is 7

Answer: B::C::D



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12. Two bulbs  $A$  and  $B$  contains  $16gO_2$  and  $16gO_3$ , respectively. Which of the statements are true?

- A. Both bulbs contain same number of atoms
- B. Both bulbs contain different number of atoms
- C. Both bulbs contain same number of molecules
- D. Bulb  $A$  contains  $N_A/2$  molecules while bulb  $B$  contains  $N_A/3$  molecules ( $N_A = \text{Avogadro's number}$ )

**Answer: A::D**

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### JEE Section (Reasoning type questions)

1. Assertion (A) : If  $30mL$  of  $H_2$  and  $20mL$  of  $O_2$  react to form water,  $5mL$  of  $H_2$  is left at the end of the reaction.

Reason (R ):  $H_2$  is the limiting reagent.

- A. Statement 1 is true, statement 2 is true, statement 2 is a correct explanation for statement 1
- B. Statement 1 is true, statement 2 is true, statement 2 is not a correct explanation for statement 1
- C. Statement 1 is true, statement 2 is false
- D. Statement 1 is false, statement 2 is true

**Answer: D**

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2. Statement-1 : Atomic mass of sodium is 23u

Statement-2 : An atom of sodium is 23 times heavier than atom of C-12 isotope

- A. Statement 1 is true, statement 2 is true, statement 2 is a correct explanation for statement 2
- B. Statement 1 is true, statement 2 is true, statement 2 is not a correct explanation for statement 2
- C. Statement 1 is true, statement 2 is false
- D. Statement 1 is false, statement 2 is true

**Answer: C**



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3. Assertion (A): Calomel is a chemical compound whereas brass is a mixture.

Reason (R ): Calomel always contains 5.6 times as much mercury as chlorine by weight. Brass can be made with widely different ratios of copper and zine.

- A. Statement 1 is true, statement 2 is true, statement 2 is a correct explanation for statement 3
- B. Statement 1 is true, statement 2 is true, statement 2 is not a correct explanation for statement 3
- C. Statement 1 is true, statement 2 is false
- D. Statement 1 is false, statement 2 is true

**Answer: A**



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4. Assertion (A):  $HNO_3$  acts only as an oxidising agent, while  $HNO_2$  acts both as an oxidising agent and a reducing agent.

Reason (R): The oxidation number of N in  $HNO_3$  is maximum.

- A. Statement 1 is true, statement 2 is true, statement 2 is a correct explanation for statement 4

- B. Statement 1 is true, statement 2 is true, statement 2 is not a correct explanation for statement 4
- C. Statement 1 is true, statement 2 is false
- D. Statement 1 is false, statement 2 is true

**Answer: A**

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5. Assertion (A): Sodium perxenate ( $Na_4XeO_6$ ) reacts with  $NaF$  in acidic medium to give  $XeO_3$  and  $F_2$

Reason (R):  $XeO_6^{4-}$  is a stronger oxidant than  $F_2$ .

- A. Statement 1 is true, statement 2 is true, statement 2 is a correct explanation for statement 5
- B. Statement 1 is true, statement 2 is true, statement 2 is not a correct explanation for statement 5



C. Statement 1 is true, statement 2 is false

D. Statement 1 is false, statement 2 is true

**Answer: A**

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6. Assertion (A): A reaction between  $Fe$  and  $I_2$  occurs, but a reaction between  $Fe^{2+}$  and  $I^{\ominus}$  does not occur.

Reason (R):  $Fe$  is a better reducing agent than  $I^{\ominus}$ .

A. Statement 1 is true, statement 2 is true, statement 2 is a correct explanation for statement 6

B. Statement 1 is true, statement 2 is true, statement 2 is not a correct explanation for statement 6

C. Statement 1 is true, statement 2 is false

D. Statement 1 is false, statement 2 is true

Answer: A

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## JEE Section (Comprehension type questions)

1. Bleaching powder and bleach solution are produced on a large scale and used in several household products. The effectiveness of bleach solution is often measured by iodometry.

$25\text{mL}$  of household bleach solution was mixed with  $30\text{mL}$  of  $0.50\text{MKI}$  and  $10\text{mL}$  of  $4\text{N}$  acetic acid. In the titration of the liberated iodine,  $48\text{mL}$  of  $0.25\text{NNa}_2\text{S}_2\text{O}_3$  was used to reach the end point. The molarity of the household bleach solution is :

A.  $0.48\text{ M}$

B.  $0.96\text{ M}$

C.  $0.24\text{ M}$

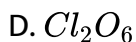
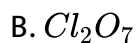
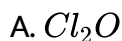
D. 0.024 M

**Answer: C**

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2. Bleaching powder and bleach solution are produced on a large scale and used in several household products. The effectiveness of bleach solution is often measured by iodometry.

Bleaching powder contains a salt of an oxoacid as one of its components. The anhydride of that oxoacid is:



**Answer: A**

3. One litre of mixture of  $O_2$  and  $O_3$  at STP was allowed to react with an excess of acidified solution of KI. The iodine liberated required 40 mL of  $\frac{M}{10}$  sodium thiosulphate solution for titration. What is the mass per cent of ozone in the mixture? Ultraviolet radiation of wavelength 300 nm can decompose ozone. Assuming that one photon can decompose one ozone molecule, how many photons would have been required for complete decomposition of ozone in the original mixture?

- A.
- B.
- C.
- D.

**Answer:**

4. One litre of mixture of  $O_2$  and  $O_3$  at STP was allowed to react with an excess of acidified solution of KI. The iodine liberated required 40 mL of  $\frac{M}{10}$  sodium thiosulphate solution for titration. What is the mass per cent of ozone in the mixture? Ultraviolet radiation of wavelength 300 nm can decompose ozone. Assuming that one photon can decompose one ozone molecule, how many photons would have been required for complete decomposition of ozone in the original mixture?

- A.
- B.
- C.
- D.

**Answer:**



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5. One litre of mixture of  $O_2$  and  $O_3$  at STP was allowed to react with an excess of acidified solution of KI. The iodine liberated required 40 mL of  $\frac{M}{10}$  sodium thiosulphate solution for titration. What is the mass per cent of ozone in the mixture? Ultraviolet radiation of wavelength 300 nm can decompose ozone. Assuming that one photon can decompose one ozone molecule, how many photons would have been required for complete decomposition of ozone in the original mixture?

A.  $1.20 \times 10^{21}$

B.  $1.20 \times 10^{20}$

C.  $1.20 \times 10^{22}$

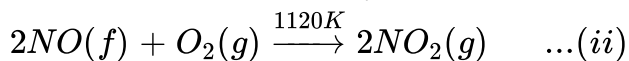
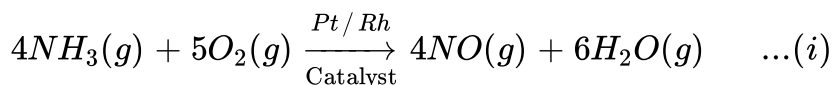
D.  $1.20 \times 10^{23}$

**Answer: A**



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6. Nitric acid is the most important oxyacid formed by nitrogen. It is one of the major industrial chemicals and is widely used. Nitric acid is manufactured by the catalytic oxidation of ammonia in what is known as the OSTWALD PROCESS which can be represented by the sequence of reactions shown below:



The aqueous nitric acid obtained by this method can be concentrated by distillation to ~ 68.5 % by weight. Further concentration to 98% acid can be achieved by dehydration with concentrated sulphuric acid.

85 kg of  $\text{NH}_3(g)$  was heated with 320 kg oxygen in the first step and  $\text{HNO}_3$  is prepared according to the above reactions. If the above reactions. If the final solution has volume 500 L, then molarity of  $\text{HNO}_3$  is :

[Assume NO formed finally is not reused]

A. 3.33 M

B. 8 M

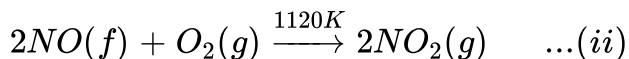
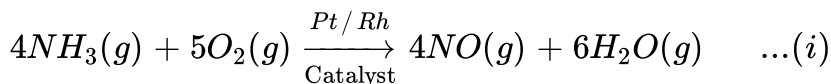
C. 2 M

D. 6.66 M

**Answer: D**

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7. Nitric acid is the most important oxyacid formed by nitrogen. It is one of the major industrial chemicals and is widely used. Nitric acid is manufactured by the catalytic oxidation of ammonia in what is known as the OSTWALD PROCESS which can be represented by the sequence of reactions shown below:



The aqueous nitric acid obtained by this method can be concentrated by distillation to ~ 68.5 % by weight. Further concentrated to 98% acid



can be achieved by dehydration with concentrated sulphuric acid. If 180 litre of water completely reacts with  $NO_2$  produced to form nitric acid according to the above reactions then the volume of air at STP containing 20% of  $NH_3$  is : ( $\rho_{H_2O} = 1 \text{ gm/ml}$ )

A.  $1.56 \times 10^6 L$

B.  $6.72 \times 10^4 L$

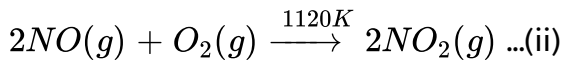
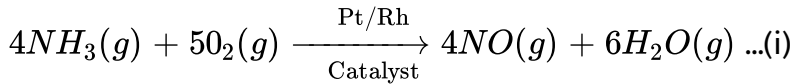
C.  $3.36 \times 10^6 L$

D. None of these

**Answer: C**

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**8.** Nitric acid is the most important oxo-acid formed by nitrogen. It is one of the major industrial chemicals and is widely used. Nitric acid is manufactured by the Ostwald process in which catalytic oxidation of ammonia is done in the following sequence as shown by reactions



In this process the aqueous nitric acid is obtained which can be concentrated by distillation to ~68.5 % by weight. Then concentration to 98% acid can be achieved by dehydration with concentrated sulfuric acid.

If 170 kg of  $NH_3$  is heated in excess of oxygen, then the volume of  $H_2O(l)$  produced in 1st reaction at STP is

$$(\rho_{H_2O} = 1g/mL)$$

A.  $33.6 \times 10^3 L$

B.  $270 L$

C.  $224 \times 10^3 L$

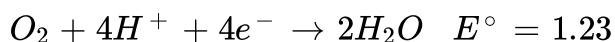
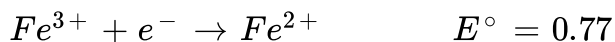
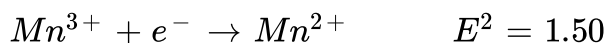
D.  $170 L$

**Answer: B**



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9. Redox reactions play a vital role in chemistry and biology. The values of standard redox potential ( $E^\circ$ ) of two half-cells reactions decide which way the reaction is expected to proceed. A simple example is a Daniell cell in which zinc goes into solution and copper gets deposited. Given below are set of half-cell reactions (acidic medium) along with their  $E^\circ$  in V with respect to normal hydrogen electrode values.



Among the following, identify the correct statement

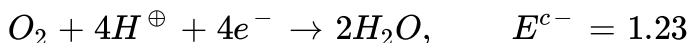
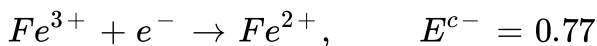
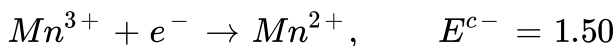
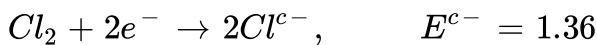
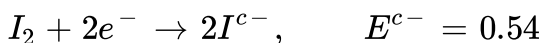
- A. Chloride ion is oxidised by  $O_2$
- B.  $Fe^{2+}$  is oxidised by iodide
- C. Iodide ion is oxidised by chlorine
- D.  $Mn^{2+}$  is oxidised by chlorine

Answer: D



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10. Redox reactions play a pivotal role in chemistry and biology. The values standard redox potential ( $E^{c-}$ ) of two half cell reactions decided which way the reaction is expected to proceed. A simple example is a Daniell cell in which zinc goes into solution and copper sets deposited. Given below are a set of half cell reactions ( acidic medium ) along with their  $E^{c-}$  (  $V$  with respect to normal hydrogen electrode ) values. Using this data, obtain correct explanations for Question.



While  $Fe^{3+}$  is stable,  $Mn^{3+}$  is not stable in acid solution because

A.  $O_2$  oxidises  $Mn^{2+}$  to  $Mn^{3+}$

B.  $O_2$  oxidises both  $Mn^{2+}$  to  $Mn^{3+}$  and  $Fe^{2+}$  to  $Fe^{3+}$

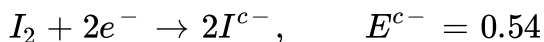
C.  $Fe^{3+}$  oxidises  $H_2O$  to  $O_2$

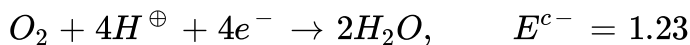
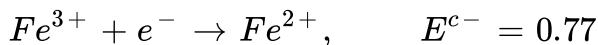
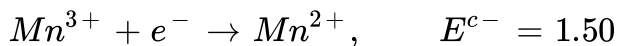
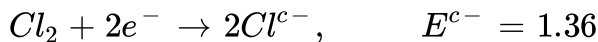
D.  $Mn^{3+}$  oxidises  $H_2O$  to  $O_2$

**Answer: D**

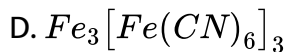
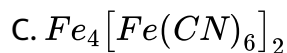
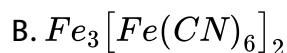
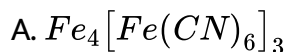
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11. Redox reactions play a pivotal role in chemistry and biology. The values standard redox potential ( $E^{c-}$ ) of two half cell reactions decided which way the reaction is expected to proceed. A simple example is a Daniell cell in which zinc goes into solution and copper sets deposited. Given below are a set of half cell reactions ( acidic medium ) along with their  $E^{c-}$  (  $V$  with respect to normal hydrogen electrode ) values. Using this data, obtain correct explanations for Question.





Sodium fusion extract obtained from aniline on treatment with iron (II) sulphate and  $\text{H}_2\text{SO}_4$  in the presence of air gives a Prussian blue precipitate. The blue colour is due to the formation of



**Answer: A**



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1. The oxidation number of Mn in the product of alkaline oxidative fusion of  $MnO_2$  is

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2. A student performs a titration with different burettes and finds titre values of  $25.2\text{mL}$ ,  $25.25\text{mL}$ , and  $25.0\text{mL}$ . The number of significant figures in the average titre value is .....

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3. Among the following, the number of elements showing only one non-zero oxidation state is:

$O, C, F, N, P, Sn, Tl, Na, Ti$

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4. A decapeptide (Mol. Wt. 769) on complete hydrolysis gives glycine (Mol. Wt. 75), alanine and phenylalanine.

Glycine contributes 47.0 % to the total weight of the hydrolysed products. The number of glycine units. Present in the decapeptide is.

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5. The difference in the oxidation numbers of two types of sulphur atoms in  $Na_2S_4O_6$  is.....

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6. The answer to each of the following questions is a single digit integer, ranging from 0 to 9. If correct answers to the question number A,B,C and D (say) are 4,0,9 and 2 respectively, then correct darkening of bubbles should be as shown on the side.

(C) Reaction of  $Br_2$  with  $Na_2CO_3$  in aqueous solution gives sodium



bromide and sodium bromate with evolution of  $CO_2$  gas. The number of sodium bromide molecules involved in the balanced chemical equation is .....

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7. 29.2 % (w/w)  $HCl$  stock, solution has a density of  $1.25 gmL^{-1}$ . The molecular weight of  $HCl$  is  $36.5 gmol^{-1}$ . The volume (mL) of stock solution required to prepare a 200mL solution of 0.4M  $HCl$  is :

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8. In dilute aqueous  $H_2SO_4$  the complete diaquadioxalatoferate (II) is oxidised by  $MnO_4^-$ . For the reaction, the ratio of the rate of change of  $[H^+]$  to the rate of change of  $[MnO_4^-]$  is

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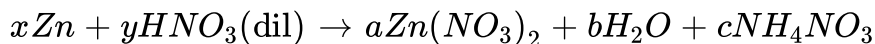
9. in neutral or faintly alkaline solution, 8 moles of permanganate anion quantitatively oxidize thiosulphate anions to produce X moles of a sulphur containing product. The magnitude of X is

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10. Washing soda ( $Na_2CO_3 \cdot 10H_2O$ ) is widely used in softening of hard water. If 1 L of hard water requires 0.0286 g of washing soda, the hardness of  $NaOH$  in ppm is

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11. In the following reaction



What is the sum of the coefficients ( $a + b + c$ )

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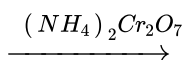
12.  $CN^\ominus$  ion is oxidised by a powerful oxidising agent to  $NO_3^\ominus$  and  $CO_2$  or  $CO_3^{2-}$  depending on the acidity of the reaction mixture.



What is the number ( $n$ ) of electrons involved in the process, divided by 10?

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13. What is the n-factor for the phenol in the following reaction Phenol



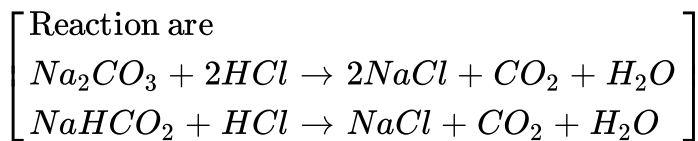
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14. The value of  $n$  in the molecular formula  $Be_nAl_2Si_6O_{18}$ .

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15. A sample contains a mixture of  $NaHCO_3$  and  $Na_2CO_3$ .

$HCl$  is added to 15.0g of the sample, yielding 11.0g of  $NaCl$ . What percent of the sample is  $Na_2CO_3$ ?



$M_w$  of  $NaCl = 58.5$ ,  $M_w$  of  $NaHCO_3 = 84$ ,  $M_w$  of  $Na_2CO_3 = 106 \text{ g mol}^{-1}$

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16. What volume of 90% alcohol by weight ( $d = 0.8 \text{ g mL}^{-1}$ ) must be used to prepare 80 mL of 10% alcohol by weight ( $d = 0.9 \text{ g mL}^{-1}$ )

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### JEE Section (Matrix Match type questions)

1. Match the reactions in Column I with the nature of the reactions/type of the products listed in Column II.



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2. Match the reaction given in Column I with average oxidation number given in Column II.



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3. Match the no. of moles listed in Column I with their relevant amounts listed in Column II.



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