CHEMISTRY ONLINE
TUITION

Phone: +442081445350

www.chemistryonlinetuition.com

Email:asherrana@chemistryonlinetuition.com

# CHEMISTRY

## MULTIPLE CHOICE - 5

## ATOMS,MOLECULES & STOICHIOMETRY

# Atoms, Molecules and Stoichiometry

**1)** *Use of the Data Booklet is relevant to this question.*

Sodium percarbonate, $(Na_2CO_3)_x.y(H_2O_2)$, is an oxidising agent in some home and laundry cleaning products.

10.0 $cm^3$ of 0.100 mol $dm^{-3}$ sodium percarbonate releases 48.0 $cm^3$ of carbon dioxide at room conditions on acidification.

An identical sample, on titration with 0.0500 mol $dm^{-3}$ $KMnO_4$, requires 24.0 $cm^3$ before the first pink colour appears. $KMnO_4$ reacts with $H_2O_2$ in the mole ratio 2 5.

What is the ratio $\frac{y}{x}$ ?

(A) $\frac{1}{3}$ (B) $\frac{2}{3}$ (C) $\frac{3}{2}$ (D) $\frac{3}{1}$

**2)** When iron is reacted with aqueous iron(III) ions, iron(II) ions are formed.

Assuming the reaction goes to completion, how many moles of Fe and of $Fe^{3+}(aq)$ would result in a mixture containing equal numbers of moles of $Fe^{3+}(aq)$ and $Fe^{2+}(aq)$ once the reaction had taken place?

| | Moles of Fe | Moles of $Fe^{3+}(aq)$ |
|---|---|---|
| A | 1 | 2 |
| B | 1 | 3 |
| C | 1 | 5 |
| D | 2 | 3 |

**3)** In an experiment, 50 $cm^3$ of a 0.1 mol $dm^{-3}$ solution of a metallic salt reacted exactly with 25 $cm^3$ of 0.1 mol $dm^{-3}$ aqueous sodium sulfite.

The half-equation for oxidation of sulfite ion is shown below.

$$SO_3^{2-}(aq) + H_2O(C) \rightarrow SO_4^{2-}(aq) + 2H^+(aq) + 2e^-$$

If the original oxidation number of the metal in the salt was 3, what would be the new oxidation numbe r of the metal?

(A) 0 (B) 1 (C) 2 (D) 4

**4)** Carbon disulfide, $CS_2$, is a volatile flammable liquid used in the manufacture of cellophane.

On combustion, $CS_2$ is oxidised as follows.

$$CS_2\,(g) + 3O_2(g) \longrightarrow CO,\,(g) + 2SO_2\,(g)$$

A 20 $cm^3$ sample of carbon disulfide vapour is ignited with 100 $cm^3$ of oxygen. The final volume of gas after burning is treated with an excess of aqueous alkali.

Which percentage of this final volume dissolves in the alkali?

[All volumes measured at the same temperature and pressure, conditions under which $CS_2$ is a gas.]

(A) 20% (B) 40% (C) 60% (D) 80%

**5)** In an attempt to establish the formula of an oxide of nitrogen, a known volume of the pure gas was mixed with hydrogen and passed over a catalyst at a suitable temperature. 100% conversion of the oxide to ammonia and water was shown to have taken place.

$$N_xO_y \xrightarrow[catalyst]{H_2(g)} xNH_3 + yH_2O$$

2400 $cm^3$ of the nitrogen oxide, measured at room temperature and pressure (r.t.p.), produced 7.20 g of water. The ammonia produced was neutralised by 200 $cm^3$ of 1.0 mol $dm^{-3}$ HC1.

[Molar volume of gas at r.t.p. .24000 $cm^3$ $mol^{-}$ I ; $A_r$: H, 1; 0, 16.]

What was the oxidation number of the nitrogen in the nitrogen oxide?

(A ) +1 (B) +2 (C) +3 (D) +4

6) Three organic molecules each have

- three elements;
- the composition, by mass, C, 54.5%; H, 9.1%.

What could these molecules be?

1 $CH_3CH_2CH_2CO_2H$

2 $OHCCH_2CH_2CH_2OH$

3 $CH_3CH{=}CHCH_2SH$

7) In an experiment, 10 $cm^3$ of an organic compound in *the* gaseous state were sparked with an excess of oxygen. 20 $cm^3$ of carbon dioxide and 5 $cm^3$ of nitrogen *were* obtained among the products. All *gas* volumes were measured at the same temperature and pressure.

Which of the following molecular formulae would fit these data?

(1) $C_2H_7N$

(2) $C_2H_3N$

(3) $C_2H_6N_2$

8) Which statement about a 12.0 g sample pf $^{12}C$ are correct?

(1) The number of atom is $6.02\times 10^{23}$

(2) The number of atoms is the same as the number of atoms in 4.0 g of $^4He$.

(3) The number of atoms is the same as the number if atoms in 2.0 g of $^1H_2$.

9) Which of the following statements will be true for *the* complete combustion of an akene in oxygen?

(1) The volume of oxygen required is directly proportional to the number of carbon atoms present in the molecule.

(2) The volume of gas produced at 25 °C is the same as for the complete combustion of an alkene with the same number of carbon atoms under the same conditions.

(3) At 120 ˚C, the volume of steam produced is always twice the volume of carbon dioxide.

**10)** Which statements about relative molecular mass are correct?

**(1)** It is the sum of the relative atomic masses of all the atoms within the molecule

**(2)** It is the ratio of the average mass of a molecule to the mass of a $^{12}C$ atom

**(3)** It is the ratio of the mass of I mot of molecules to the mass of I mol of $^{1}H$ atoms

**11)** Given weighed samples of the same mixture of magnesium carbonate and barium carbonate, how can the mole fraction of magnesium carbonate in the mixture be estimated?

(1) Add a known volume of 0.1 mol $dm^{-3}$ HCI(aq), in excess, and back titrate the excess of acid.

(2) Add an excess of HCI(aq) and measure, at known temperature and pressure, the volume of CO, liberated.

(3) Add an excess of HCI(aq) followed by an excess of $H_2SO_4$(aq); filter, dry and weigh the precipitate.

**12)** A group of students attempted to estimate the concentration of a solution of Fr'· by pipetting fixed volumes of the solution into a flask, adding an excess of dilute sulfuric acid, and then titrating with a standard solution of potassium manganate (VII) from a burette. The volume of $KMn0_4$ so lution required by one student was 0.2 cm$^{l}$ higher that that of the other students

Which of the following are possible explanations for this discrepanc)"

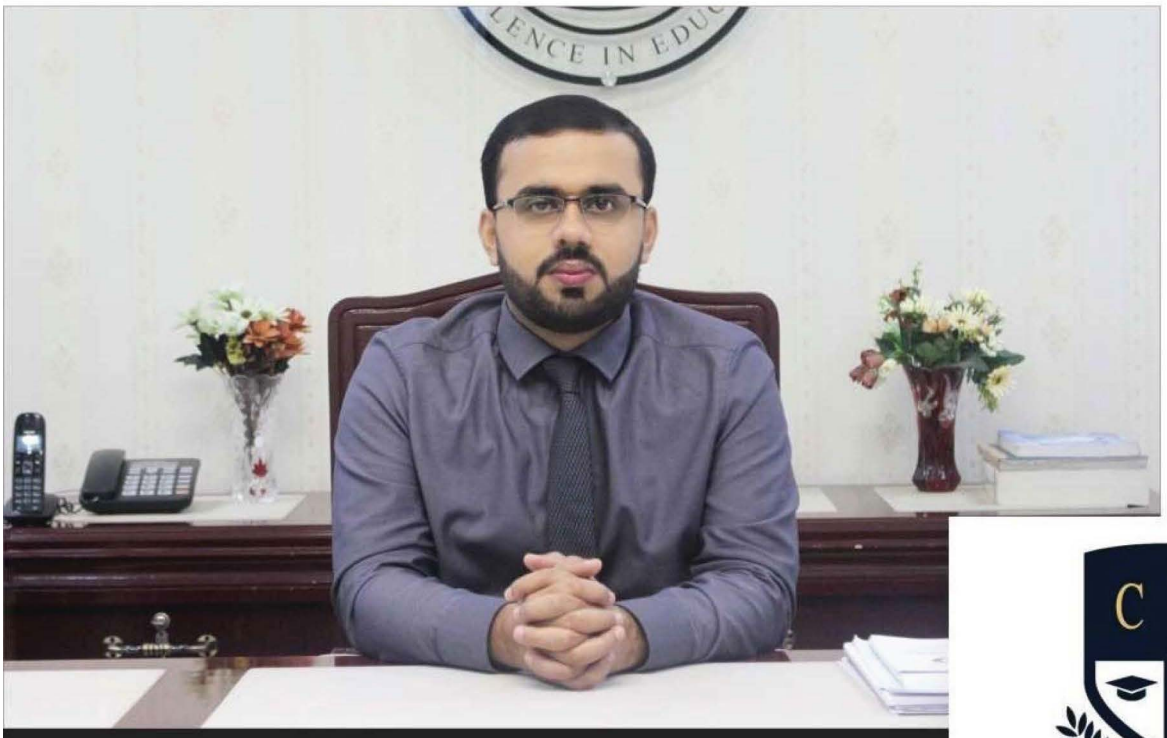
**(1)** The titration flask was rinsed with the solution of Fe$^{e`}$ instead of water before titration.

**(2)** The last drop of Fee' solution was blwATi from the pipette into the flask.

**(3)** The burette was rinsed with water instead of the solution of $104n0_4$ before titration.

I am Sorry !!!!!



# DR. ASHAR RANA

## M.B.B.S / MS. CHEMISTRY

CHEMISTRY ONLINE TUITION

Phone: +442081445350
www.chemistryonlinetuition.com
Email: asherrana@chemistryonlinetuition.com

- Founder & CEO of Chemistry Online Tuition Ltd.
- Completed Medicine (M.B.B.S) in 2007
- Tutoring students in UK and worldwide since 2008
- CIE & EDEXCEL Examiner since 2015
- Chemistry, Physics, Math's and Biology Tutor

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CONTACT INFORMATION FOR
**CHEMISTRY ONLINE TUITION**

- UK Contact: 02081445350
- International Phone/WhatsApp: 00442081445350
- Website: www.chemistryonlinetuition.com
- Email: asherrana@chemistryonlinetuition.com

Address: 210-Old Brompton Road, London SW5 OBS, UK