

Nov 2007 H1 Chemistry Answers

Paper 1: Multiple Choice

1	C	2	A	3	C	4	A
5	C	6	C	7	A	8	D
9	C	10	A	11	C	12	A
13	C	14	D	15	D	16	D
17	A	18	C	19	B	20	C
21	B	22	D	23	C	24	B
25	D	26	A	27	B	28	B
29	B	30	C				

1 C

No. of Au atoms in the pure gold ring
 $= (3.94/197) \times 6 \times 10^{23} = 1.20 \times 10^{22}$

2 A

$\text{NH}_4\text{NO}_3 \rightarrow 2\text{H}_2\text{O} + \text{N}_2\text{O}$
O.S. of N in $\text{N}_2\text{O} = +1$

3 C

$\text{CS}_2 + 2\text{NO} \rightarrow 2\text{S} + \text{CO}_2 + \text{N}_2$
The yellow solid is S.
The rest of the options will not give equal volumes of 2 gases.

4 A

HT contains 2 neutrons.
 D_2 contains 2 neutrons. DT contains 3 neutrons. HD contains 1 neutron.
 T_2 contains 4 neutrons.

5 C

X belongs to Group VI with valence electronic configuration ns^2np^4 . The greatest increase in I.E. is that between the 6th and 7th I.E. Thus, there are 6 valence electrons in X. Due to removal of electrons from different subshells, there is a significant increase between the 4th and 5th I.E.

6 C

Butanone, $\text{CH}_3\text{COCH}_2\text{CH}_3$, M_r 72, is a polar molecule held by dipole-dipole forces between molecules. Pentane, $\text{CH}_3(\text{CH}_2)_3\text{CH}_3$, M_r 72, is a non-polar molecule held by van der Waals' (dispersion) forces between

molecules. More energy is needed to overcome stronger dipole-dipole forces between butanone molecules during boiling.

7 A

Presence of extra N–H group in hydrazine allows more hydrogen bonds to be formed between hydrazine and water compared to that in ammonia.

8 D

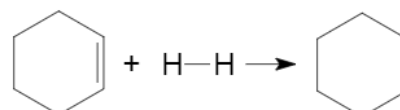
Since solid iodine readily forms iodine vapour, there are only weak dispersion forces between the molecules in the solid state and iodine vapour also exists in the molecular state.

9 C

ΔH_f^\ominus is the enthalpy change when one mole of a substance is formed from its constituent elements in their standard states.

Thus, $\text{H}_2(\text{g}) + \frac{1}{2}\text{O}_2(\text{g}) \rightarrow \text{H}_2\text{O}(\text{l})$

10 A



$$\begin{aligned}\Delta H &= \Sigma \text{BE}(\text{reactants}) - \Sigma \text{BE}(\text{product}) \\ &= \text{BE}(\text{C}=\text{C}) + \text{BE}(\text{H}-\text{H}) - \text{BE}(\text{C}-\text{C}) \\ &\quad - 2\text{BE}(\text{C}-\text{H}) \\ &= 610 + 436 - 350 - 2(410) \\ &= -124 \text{ kJ mol}^{-1}\end{aligned}$$

11 C

$\text{CH}_3\text{OH}(\text{g}) + \text{CO}(\text{g}) \rightleftharpoons \text{CH}_3\text{CO}_2\text{H}(\text{g})$
A catalyst affects the rate at which eqm is achieved and does not affect the eqm concentration of product ($\text{CH}_3\text{CO}_2\text{H}$) obtained at eqm. Increasing the pressure of the system causes the eqm position to shift right so as to lower the pressure since there is less gaseous product than gaseous reactants. Eqm $[\text{CH}_3\text{CO}_2\text{H}]$ increases. Increasing the temperature of the system

causes the eqm position to shift left so as to remove the excess heat since the backward reaction is endothermic. Eqm $[\text{CH}_3\text{CO}_2\text{H}]$ decreases.

12 A

Bromocresol green is blue \Rightarrow pH of solution > 5.5 .

Phenol red is yellow \Rightarrow pH of solution < 6.8 .

Thus, pH of solution is between 5.5 and 6.8 which is weakly acidic.

13 C

^{238}U undergoes radioactive decay to form Pb as the final product. It is a 1st order reaction with $t_{1/2} = 4.5 \times 10^9$ years.

Years	0	4.5×10^9	9.0×10^9
^{238}U / mol	x	x/2	x/4
Pb / mol	0	x/2	3x/4
^{238}U : Pb	-	1 : 1	1 : 3

14 D

At low [acid], rate = $k[\text{acid}]$, i.e. rate \propto [acid].

At high [acid], rate = $k = \text{constant}$.

15 D

O.S. of X in $\text{XO}_2 = +4$

O.S. of X in $\text{XO}_3 = +6$

O.S. of X in $\text{H}_2\text{XO}_3 = +4$

Thus, X belongs to Group VI where the highest O.S. of X is +6.

16 D

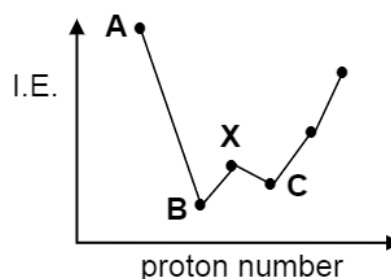
J is not sodium as sodium reacts readily with cold water to form NaOH.

J is not magnesium or aluminium as MgO and Al_2O_3 are insoluble in water. Thus, they do not react readily with water to form an acidic solution.

J is phosphorus as it does not react with cold water. However, it reacts vigorously with oxygen to give P_4O_{10} which reacts readily with water to form H_3PO_4 , an acidic solution.

17 A

X belongs to Group II as there is a big decrease in I.E. from A to B, i.e. A and B belongs to different periods. A decrease in I.E. from X to C as C involves removal of electron from the p orbital which requires less energy to remove than the electron removed from the s orbital in X.



18 C

For A, it is a *trans-trans* isomer.

For B, it is a *cis-trans* isomer.

For C, it is a *cis-cis* isomer.

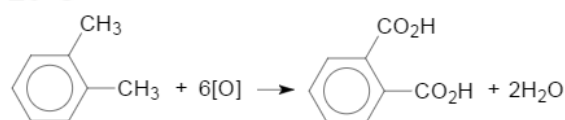
For D, it is a *trans-cis* isomer.

19 B

Isomers of an alkene of formula C_4H_8 are $\text{CH}_2=\text{CHCH}_2\text{CH}_3$, $\text{CH}_2=\text{C}(\text{CH}_3)_2$ and $\text{CH}_3\text{CH}=\text{CHCH}_3$.

Action of bromine on these alkenes will give $\text{CH}_2\text{BrCHBrCH}_2\text{CH}_3$, $\text{CH}_2\text{BrCBr}(\text{CH}_3)_2$ and $\text{CH}_3\text{CHBrCHBrCH}_3$ respectively.

20 C



No. of mol of 1,2-dimethylbenzene = No. of mol of benzene-1,2-dicarboxylic acid = 1.00/106

Mass of benzene-1,2-dicarboxylic acid = $(1.00/106) \times 166 = 1.57 \text{ g}$

21 B

Breaking of C–X bond in CFCs lead to ozone depletion as X• radicals attack ozone.

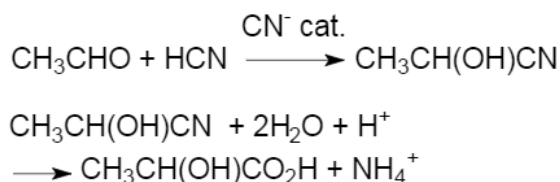
22 D

C–I bond in iodoethane is weaker than the C–Cl bond in chloroethane due to bigger I atom leading to lesser overlap between orbitals of C and I. Thus, C–I bond is broken more readily leading to precipitation reaction between Ag^+ and I^- ions.

23 C

Orange ppt with 2,4-DNPH
 \Rightarrow X is a carbonyl compound.
Yellow ppt with $\text{I}_2/\text{OH}^-(\text{aq})$
 \Rightarrow X contains CH_3COR or $\text{CH}_3\text{CH}(\text{OH})\text{R}$ structure.
No reaction with Fehling's reagent
 \Rightarrow X is not an aldehyde.
Combining all above observations, X is molecule C.

24 B



25 D

Concentrated H_2SO_4 is a catalyst in the preparation of ester from alcohol and carboxylic acid by providing H^+ ions to catalyse the reaction.

26 A (to check explanation)

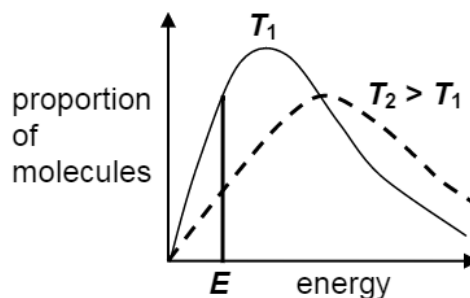
For 1, SiO_2 is a giant molecular structure with each Si atom covalently bonded to four O atoms and each O atom covalently bonded to two Si atoms. Thus, all the outer shells of Si and O atoms have a full octet of electrons.

For 2, SiC is a giant molecular structure with each Si atom

covalently bonded to four C atoms and vice versa. Thus, all the outer shells of Si and C atoms have a full octet of electrons.

For 3, Mg atom loses 2e^- to form Mg^{2+} and O atom gains 2e^- to form O^{2-} . Thus, all the outer shells of Mg^{2+} and O^{2-} ions have a full octet of electrons.

27 B



For 1, as temperature increases ($T_2 > T_1$), the maximum of the curve is displaced to the right to keep the area under the curve constant since the spread of the energies increases. For 2, as temperature increases ($T_2 > T_1$), the proportion of molecules with energies above any given value (e.g. E) increases.

For 3, as temperature increases ($T_2 > T_1$), the proportion of molecules with lower energy decreases (e.g. E) and that with higher energy increases.

28 B

For 1, the aluminium atom in AlCl_3 molecule has only 6 electrons around it, i.e. it has an unfilled octet.

For 2, AlCl_3 molecule is trigonal planar with 3 bond pairs and 0 lone pair of electrons around aluminium atom. Thus, it is planar in shape.

For 3, AlCl_3 exists as AlCl_3 molecules in the molten state.

29 B

For 1, it is $\text{CCl}_3\text{CH}_2\text{CH}_3$.

For 2, it is $\text{CH}_2\text{CClCCl}_2\text{CH}_3$.

For **3**, it is the same molecule as **2**.
Thus, it should be renamed as **2**.

30 C

For **1**, there is no reaction.

For **2**, sodium bromide and sulphuric acid generate HBr in the reaction to convert ethanol to bromoethane.

For **3**, red phosphorus and bromine generate PBr_3 in the reaction to convert ethanol to bromoethane.