

ST. MICHAEL'S INSTITUTION, IPOH
TRIAL EXAMINATION
CHEMISTRY PAPER 1 (MULTIPLE – CHOICE)

Upper 6 Science

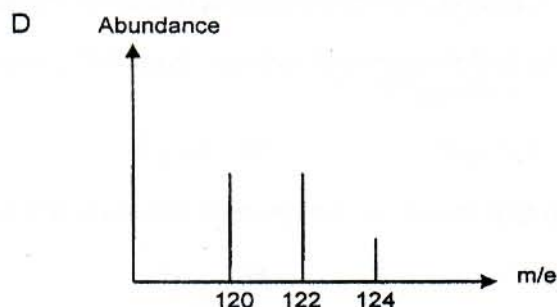
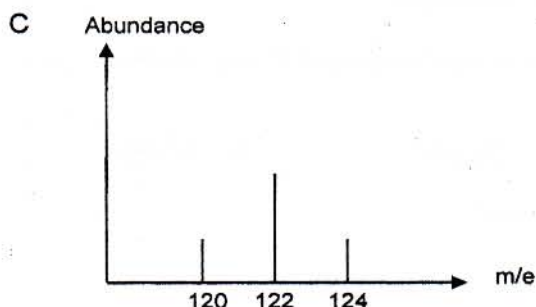
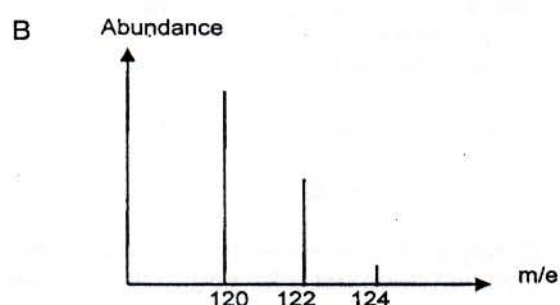
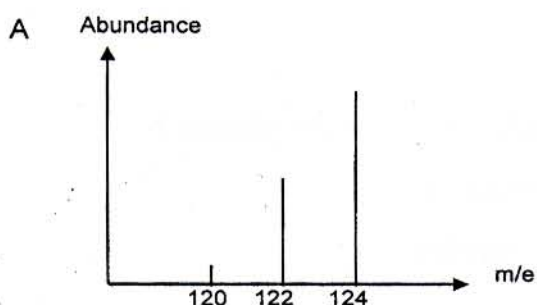
1 hour 45 mins

Instructions : There are 50 questions in this paper. For each question, choose one correct answer and indicate it on the multiple – choice answer sheet provided.
 The use of Data Booklet is not allowed.

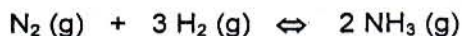
Section A

Four suggested answers labelled A, B, C and D are given for each question. Choose *one* correct answer.

- 1 CF_2Cl_2 is a coolant used in refrigerators. Which is the possible mass spectrum for CF_2Cl_2 ?
 Isotopes present are ^{12}C , ^{19}F , ^{35}Cl and ^{37}Cl . Ratio of $^{35}\text{Cl} : ^{37}\text{Cl} = 3 : 1$.



- 2 A mixture of nitrogen – hydrogen in a ratio of 1:3 is left to reach equilibrium as shown.



When 50% of the nitrogen has reacted, the pressure was found to be p .
 What is the pressure of ammonia in the equilibrium mixture ?

A $\frac{p}{3}$

B $\frac{p}{4}$

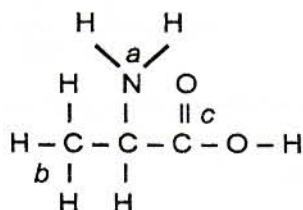
C $\frac{p}{9}$

D $\frac{p}{12}$

- 3 Which of the following is correct in relation to the number of electrons and number of neutrons in the particles concerned ?

	Particle	No. of electrons	No. of neutrons
A	$^{79}_{35}\text{Br}^+$	36	44
B	$^{19}_9\text{F}$	19	10
C	$^{18}_8\text{O}^{2-}$	10	10
D	$^{31}_{15}\text{P}^{3-}$	18	15

- 4 Which of the following pairs of orbitals, when overlap with one another form the strongest single covalent bond ?
- A 1s with 1s B 1s with 2s C 1s with 2p D 2s with 2p
- 5 In the CO_3^{2-} ion,
- A there are two single and one double bonds
 B all the bonds are single bonds
 C all the bonds are double bonds
 D all the bonds are intermediate between that of a single bond and a double bond
- 6 Which oxide of the elements in Group 14 is the most acidic ?
- A SnO_2 B SiO_2 C PbO_2 D GeO_2
- 7 The rate-determining step in a mechanism is
- A the fastest step of the reaction
 B the one with the highest activation energy
 C the first step of the reaction
 D the last step of the reaction
- 8 Which of the following is correct with regards to a catalyst for the reaction below ?
- $$\text{P} + \text{Q} \rightleftharpoons \text{R} + \text{S} \quad \Delta H = \text{negative}$$
- A Catalyst will decrease the enthalpy change of the reaction
 B Catalyst does not take part in the reaction
 C Catalyst increases the rate of effective collisions
 D Catalyst will alter the composition of the equilibrium mixture
- 9 What is the volume of oxygen required for the complete combustion of 20 cm^3 methane and 10 cm^3 ethene ?
- A 100 cm^3 B 70 cm^3 C 30 cm^3 D 50 cm^3
- 10 The formula of the amino acid alanine is shown as follows.



What are the approximate values of bond angles a , b and c ?

- | | | | |
|---|-------------|---------------|---------------|
| | a | b | c |
| A | 107° | 109.5° | 120° |
| B | 107° | 109.5° | 90° |
| C | 120° | 109.5° | 109.5° |
| D | 120° | 109.5° | 120° |
- 11 A sample of butan-2-one is treated with lithium tetrahydridoaluminate(III) and then with concentrated sulphuric acid at 180°C . Which of the following is **true** about the compound produced ?
- A It shows optical isomerism
 B It undergoes nucleophilic addition
 C It decolourises acidified potassium manganate(VII)
 D It reacts with sodium metal to give hydrogen gas

12 Which of the following reagents can be used to distinguish between cyclohexanol and phenol ?

- A Ethanoyl chloride
B Aqueous bromine
C Concentrated sulphuric acid
D Sodium metal

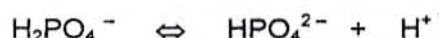
13 An alcohol $C_4H_{10}O$ has n isomers, m of which are optically active. Which of the following is the correct combination of n and m ?

	n	m
A	4	2
B	5	2
C	3	1
D	4	1

14 How many unpaired electrons are there in the ground state of chromium atom (proton no. 24) ?

- A 5 B 2 C 4 D 6

15 The pH of blood is maintained at about 7.4 by the following equilibrium system.



What is the ratio of $H_2PO_4^-$ to HPO_4^{2-} in the blood ?

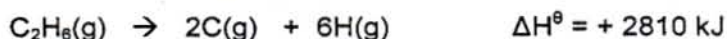
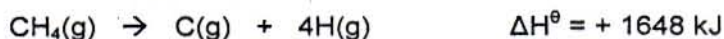
[K_a of $H_2PO_4^- = 6.3 \times 10^{-8} \text{ mol dm}^{-3}$]

- A 0.37 B 0.63 C 1.49 D 2.70

16 Which of the following is **true** regarding electrolysis ?

- A Oxidation occurs at the cathode and reduction occurs at the anode
B Electrons flow from the cathode to the anode through the external circuit
C The ease of discharge of metal ions is inversely proportional to the reactivity of the metals
D The amount of substances produced during electrolysis is directly proportional to the amount of electric charge and the charge on the ions

17 Given the following :



What is the bond energy of the C – C bond ?

- A - 676 kJ B - 338 kJ C + 338 kJ D + 676 kJ

18 A liquid mixture containing n_X mole of X and n_Y mole of Y forms an ideal solution. If the vapour pressure of pure X and pure Y are respectively P_X° and P_Y° , while the partial pressure of X and Y are P_X and P_Y , which of the following is **not** true ?

- A $P_Y = n_Y P_Y^\circ$
B Total pressure of mixture = $P_X + P_Y$
C If $n_X > n_Y$, then $P_X^\circ > P_Y^\circ$
D On mixing X with Y, there is no enthalpy change

19 The partition coefficient of a substance W between ether and water is 8.0 at room temperature. An aqueous solution containing 10.0 g of W in 100 cm³ of water is extracted with 100 cm³ of ether. What is the mass of W left in the aqueous layer after the extraction with ether ?

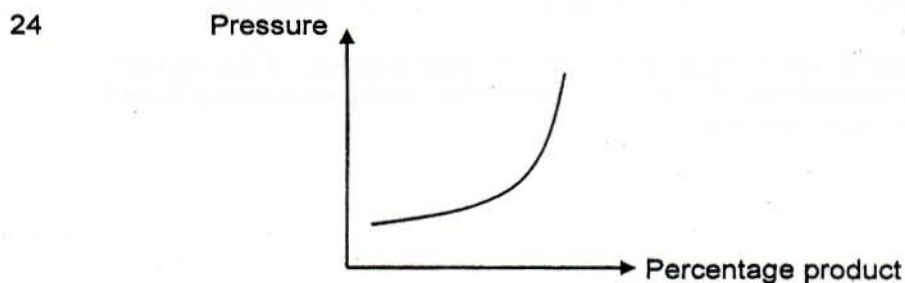
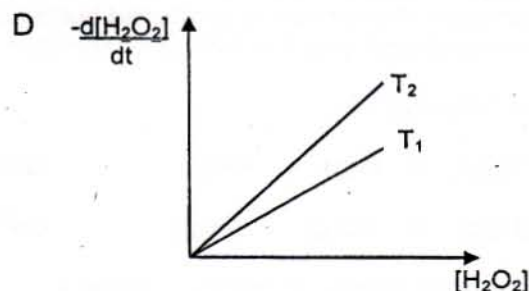
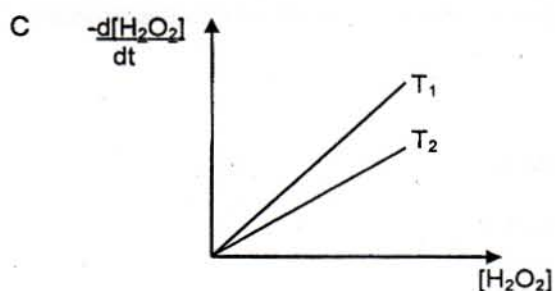
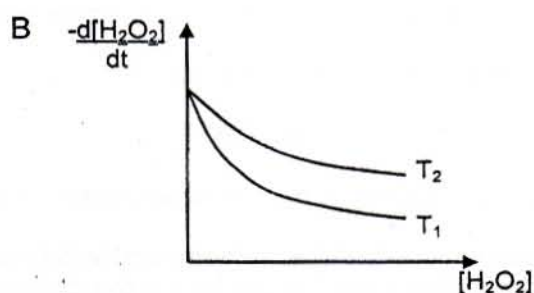
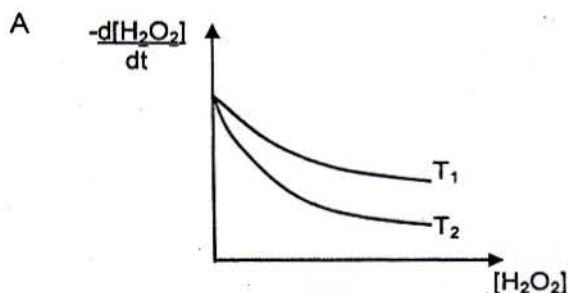
- A 4.44 g B 8.89 g C 1.11 g D 2.22 g

- 20 The relative atomic mass of carbon (proton no. 6) is 12.01. Carbon has two isotopes having 6 and 7 neutrons respectively. What is the percentage abundance of the heavier isotope?
- A 99.0 B 13.0 C 1.00 D 42.0
- 21 At 273 K, 50% of 2 moles of PCl_5 in a container of 22.4 dm^3 capacity decomposes according to the following equation.



What is the total pressure in the container after the dissociation?
[1 mole of gas occupies 22.4 dm^3 at s.t.p.]

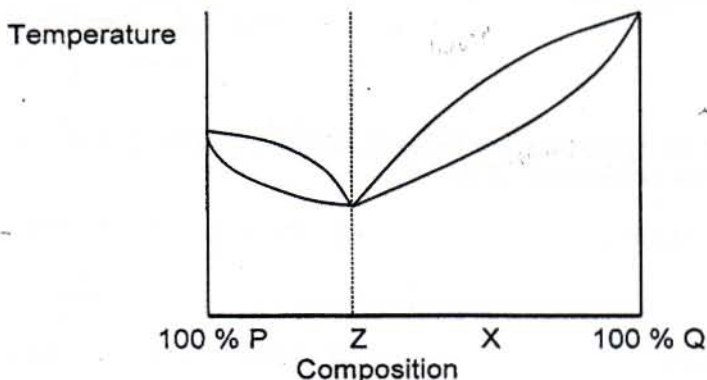
- A 3.0 atm B 2.0 atm C 1.5 atm D 1.0 atm
- 22 Xenon reacts with fluorine to form XeF_4 . The shape of the XeF_4 molecule is expected to be
- A tetrahedral B see-saw C square planar D trigonal bipyramidal
- 23 The decomposition of hydrogen peroxide is first order; reaction is investigated under temperatures T_1 and T_2 . Which of the following graphs is correct if $T_2 > T_1$?



Which of the following reaction will give a graph as shown above?

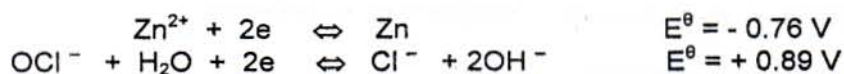
- A $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightleftharpoons 2 \text{HI}(\text{g})$
 B $\text{N}_2(\text{g}) + 3 \text{H}_2(\text{g}) \rightleftharpoons 2 \text{NH}_3(\text{g})$
 C $\text{N}_2\text{O}_4(\text{g}) \rightleftharpoons 2 \text{NO}_2(\text{g})$
 D $\text{CaCO}_3(\text{s}) \rightleftharpoons \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$

- 25 $X + Y \rightleftharpoons 2Z$
When a mixture containing 3 moles X and 5 moles Y is allowed to achieve equilibrium, the equilibrium mixture is found to contain 2 moles of Z. The K_c for the reaction is
- A 0.250 B 0.125 C 0.500 D 0.267
- 26 What is the final pH of the solution formed on mixing 100 cm^3 0.10 mol dm^{-3} sodium hydroxide and 100 cm^3 0.10 mol dm^{-3} sulphuric acid?
- A 1.3 B 7.0 C 1.0 D 12.7
- 27 High tension electric cables are normally made from aluminium because
- A aluminium is resistant to corrosion and is more long-lasting than copper wire
B aluminium wire is cheaper than copper wire
C aluminium has a low density and is a good electrical conductor
D aluminium is cheap and can be recycled
- 28 Which nitrate of the elements of Group 2 has the highest thermal stability?
- A Strontium nitrate B Calcium nitrate C Beryllium nitrate D Barium nitrate
- 29 When chlorine gas is passed through concentrated sodium hydroxide at 70°C , the anions formed are
- A ClO_3^- , ClO_4^- B Cl^- , ClO_3^- C Cl^- , ClO^- D Cl^- , ClO_2^-
- 30 The solubility product of silver chloride is $1.0 \times 10^{-10} \text{ mol}^2 \text{ dm}^{-6}$. What is the solubility of silver chloride in 1 dm^3 solution of sodium chloride 0.01 mol dm^{-3} ?
- A $1.0 \times 10^{-9} \text{ mol}$ B $1.0 \times 10^{-8} \text{ mol}$ C $1.0 \times 10^{-6} \text{ mol}$ D $1.0 \times 10^{-10} \text{ mol}$
- 31 The boiling point – composition graph for two miscible liquids P and Q is shown below:



What is the composition of the distillate and residual liquid if a mixture of composition X is fractionally distilled?

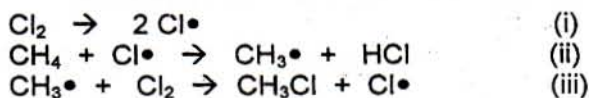
- A P and Q B Z and P C Z and Q D Z only
- 32 An electric cell is prepared by using zinc electrode immersed in an aqueous solution of zinc sulphate, and a platinum electrode immersed in an aqueous solution of potassium chlorate(I).



Which of the following statements is **not** true for the above cell?

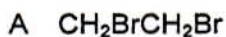
- A The zinc electrode is the anode
B The chlorate(I) ion acts as oxidising agent
C Electrons flow from the platinum electrode to the zinc electrode
D The e.m.f. of the cell is + 1.65 V

33 The reaction mechanism between chlorine and methane is shown below .

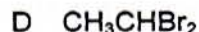
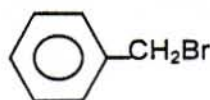


Which of the following is **not** true regarding the reaction ?

- A Reaction (i) requires ultra-violet light
 B Reaction can occur in the dark if the mixture is heated with benzoyl peroxide
 C CH_3Cl is the only chloro - product formed
 D A little ethane is also formed in the reaction
- 34 Compound X reacts with aqueous sodium hydroxide to produce a compound that gives a yellow - orange precipitate with 2,4 - dinitrophenylhydrazine . X is



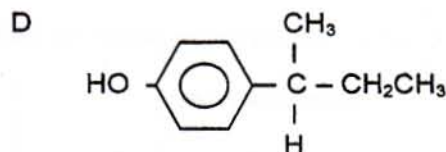
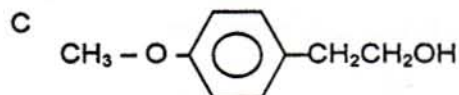
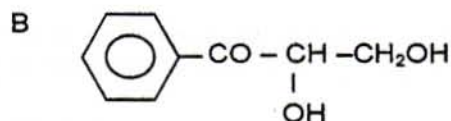
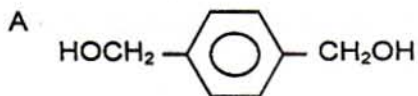
C



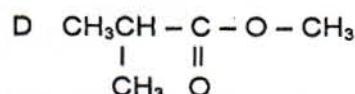
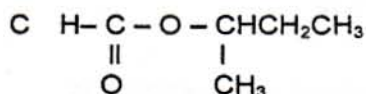
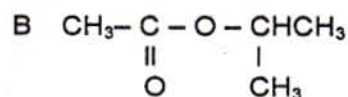
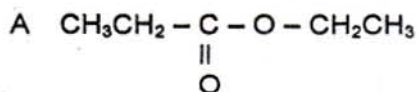
35 Compound W has the following properties.

- (i) It reacts readily with PCl_5 with the release of white fumes
 (ii) It exists as a pair of enantiomers

W is



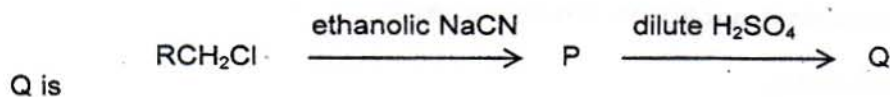
36 Compound Z, $\text{C}_5\text{H}_{10}\text{O}_2$, on hydrolysis produces V, $\text{C}_2\text{H}_4\text{O}_2$ and W, $\text{C}_3\text{H}_8\text{O}$. W reacts with alkaline iodine to produce a yellow precipitate. Z is



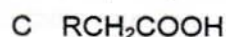
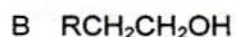
37 The correct order of increasing basicity of ammonia, ethylamine, methylamine and phenylamine is

- A Ammonia < methylamine < ethylamine < phenylamine
 B Phenylamine < ammonia < methylamine < ethylamine
 C Ethylamine < methylamine < phenylamine < ammonia
 D Phenylamine < methylamine < ethylamine < ammonia

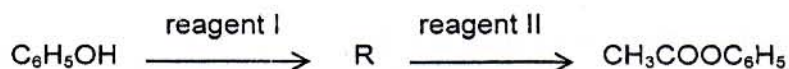
38 Consider the following reactions :



Q is



- 39 Phenol can be used to produce $\text{CH}_3\text{COOC}_6\text{H}_5$ by the following route. R is an intermediate.



What is the reagent I and reagent II in the above scheme ?

	Reagent I	Reagent II
A	PCl_5	CH_3COCl
B	Na	CH_3COCl
C	NaOH	CH_3COOH
D	PCl_5	CH_3COOH

- 40 Which of the following compounds will decolourise acidified potassium manganate(VII) and bromine in tetrachloromethane ?

A $\text{CH}_3\text{CH}=\text{CH}_2$ B $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$ C $(\text{CH}_3)_3\text{COH}$ D $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$

Section B

For each question in this section, one or more of the three numbered statements 1 to 3 may be correct. The responses A to D should be selected as follows :

A	B	C	D
1 only is correct	1 and 2 only are correct	2 and 3 only are correct	1, 2 and 3 are correct



Which of the following statements is / are true regarding the above reaction ?

- 1 H_2PO_4^- acts as an acid
- 2 HCO_3^- and CO_2 are a conjugate acid – base pair
- 3 The reaction is exothermic

- 42 The degree of deflection of a positive ion in a mass spectrometer is

- 1 directly proportional to the charge on the ion
- 2 inversely proportional to the mass of the ion
- 3 dependent on the strength of the magnetic field

- 43 In the Lyman series

- 1 all the lines are in the ultra-violet region
- 2 transitions occur between higher energy levels and the $n=1$ level
- 3 the line with the maximum wavelength can be used to calculate the ionisation energy of hydrogen

- 44 The melting point of three elements increases in the order : $\text{Na} < \text{Mg} < \text{Al}$
This is because

- 1 the number of valence electrons increases
- 2 the atomic size increases
- 3 the relative atomic mass increases

- 45 The lattice energy of MgO and NaF are -3940 and -920 kJ mol^{-1} respectively .
Their difference is due to

- 1 the higher charge on the magnesium and oxide ions
- 2 the size of Mg^{2+} is smaller than the size of Na^+
- 3 MgO is more ionic than NaF

