

SMJK TSUNG WAH
KUALA KANGSAR PERAK

Peperiksaan Percubaan 2009

Chemistry Paper 1

TINGKATAN 6 Atas

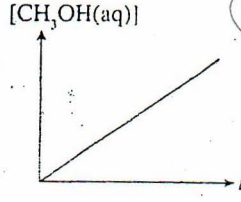
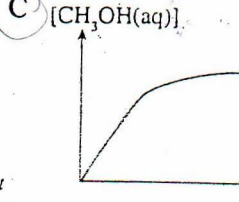
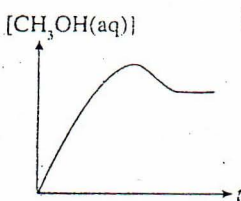
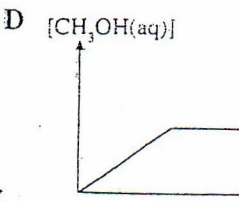
Penyedia soalan: En. Teh Tzong Yuan

Masa: 7:30 - 9:05

Tarikh: 03 / 09 / 09

Instructions:

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

1. The synthesis of ammonia is an exothermic, reversible reaction catalysed by metallic iron. Which of the following operations will increase both the rate of the forward reaction and the equilibrium yield of ammonia?
- ☐ A Increasing the temperature.
☒ B Increasing the total pressure.
☐ C Adding a promoter to the catalyst.
☐ D Removing the ammonia as soon as it is formed.
2. A flask containing 10 g of gas, of relative molecular mass 100, at a pressure of 100 kPa was evacuated by means of a pump until the pressure was 0.01 kPa. Which of the following is the best estimate of the number of molecule left in the flask? [100 kPa = 1 atm. The Avogadro constant, $L = 6 \times 10^{23}$ per mol]
- A 6×10^{13} C 6×10^{18}
B 6×10^{17} ☒ D 6×10^{19}
3. For which of the following systems does the equilibrium constant have units of concentration?
- ☐ A $\text{H}_2 + \text{Br}_2 \rightleftharpoons 2\text{HBr}$
☐ B $\text{CH}_4 + \text{H}_2\text{O} \rightleftharpoons \text{CO} + 3\text{H}_2$
☒ C $\text{N}_2\text{O}_4 \rightleftharpoons 2\text{NO}_2$
☐ D $\text{Cl}_2 + \text{PCl}_3 \rightleftharpoons \text{PCl}_5$
4. In the equilibrium of $\text{C}_6\text{H}_5\text{COOH} + \text{H}_2\text{O} \rightleftharpoons \text{C}_6\text{H}_5\text{COO}^- + \text{H}_3\text{O}^+$, the equilibrium constant is most likely to be changed by
- A adding a suitable catalyst
B adding sodium benzoate
☒ C heating the mixture
☐ D adding water
5. Which of the following molecules would be expected to be linear?
- ☒ A $\text{O}=\text{C}=\text{C}=\text{C}=\text{O}$
☐ B $\text{H}-\text{O}-\text{O}-\text{H}$
☐ C $\text{O}=\text{N}-\text{Br}$
☐ D $\text{Cl}-\text{S}-\text{Cl}$
6. Which of the following graphs best shows the relationship between $[\text{CH}_3\text{OH}(\text{aq})]$ and t , the time from mixing of the reactants, for the reaction $\text{HCOOCH}_3(\text{aq}) + \text{NaOH}(\text{aq}) \rightarrow \text{HCOONa}(\text{aq}) + \text{CH}_3\text{OH}(\text{aq})$?
- A  ☒ C 
B  D 
7. Which of the following equations corresponds to the definition of lattice energy of the ionic compound $\text{X}^+\text{Y}^-(\text{s})$?
- A $\text{X}^+\text{Y}^-(\text{s}) \rightarrow \text{XY}(\text{s})$
☒ B $\text{X}^+(\text{g}) + \text{Y}^-(\text{g}) \rightarrow \text{XY}(\text{s})$
☐ C $\text{X}^\bullet(\text{g}) + \text{Y}^\bullet(\text{g}) \rightarrow \text{XY}(\text{s})$
☐ D $\text{X}(\text{g}) + \text{Y}(\text{g}) \rightarrow \text{XY}(\text{s})$
8. In which of the following compounds has chlorine an oxidation state of +3?
- A HClO C NaClO_3
B Cl_2O_6 ☒ D NaClO_2

- 9 Which of the following gases is present in the exhaust fumes of a car engine in much greater amount than any other gases?

☒ A Carbon dioxide
☐ B Carbon monoxide
☒ C Nitrogen
☐ D Unburnt hydrocarbons

- 10 Which of the following statements is true about tin when compared with lead?

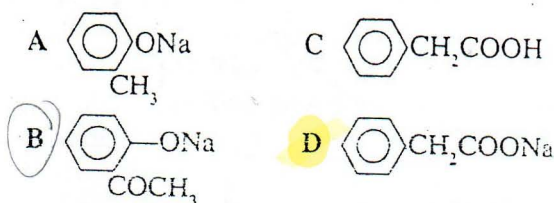
☐ A It has a higher density.
☐ B It has a higher melting point.
☒ C The oxidation state of +2 is more stable.
☒ D Its tetrachloride is more stable.

- 11 Concentrated sulphuric acid is added separately to a sample of sodium chloride, sodium bromide, sodium iodide, and sodium astatide. Which sample does **not** form halogen, X_2 , as one of the products?

☒ A Sodium chloride
☐ B Sodium bromide
☐ C Sodium iodide
☒ D Sodium astatide

- 12 An organic compound gave the following reactions:

- (i) when heated strongly in air, a white residue remained;
 (ii) when warmed with ethanol and concentrated sulphuric acid, an ester was produced.
 The original compound could have been



- 13 The standard electrode potential, E^\ominus , of X, Y, and Z are given below.

Electrode reaction	E^\ominus / V
$X(aq) + e \rightarrow X^-(aq)$	-0.90
$Y(aq) + e \rightarrow Y^-(aq)$	+1.89
$Z(aq) + e \rightarrow Z^-(aq)$	+0.76

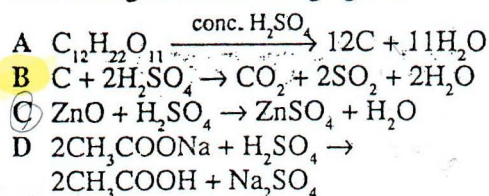
Which of the following species is the strongest oxidising agent?

☒ A Y^- ☐ C Y
☐ B Y^- ☐ D Z^-

- 14 Which of the following oxides produces the lowest pH when 1.0 mol of the oxide is dissolved in 1 dm³ of water?

☐ A K_2O ☐ C MgO
☒ B SO_3 ☒ D P_2O_{10}

- 15 In which of the following reactions is sulphuric acid acting as an oxidising agent?



- 16 For a general cell reaction,

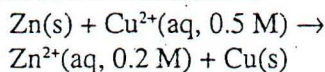


the Nernst equation is given by the following expression

$$E_{\text{cell}} = E^\ominus_{\text{cell}} - \frac{0.059}{n} \log \frac{[C]^c [D]^d}{[A]^a [B]^b}$$

where n is the number of electrons transferred.

By using the above equation, the electromotive force of a cell reaction is



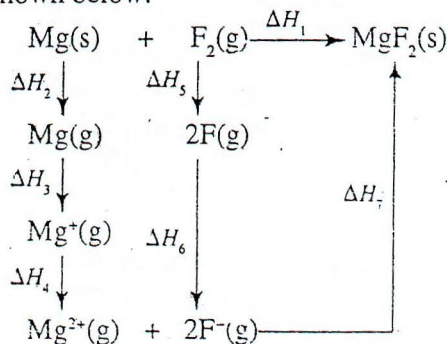
Standard electrode potential	E^\ominus / V
$Zn^{2+} + 2e \rightarrow Zn$	-0.76
$Cu^{2+} + 2e \rightarrow Cu$	+0.34

A 2.16 V ☒ C 1.11 V
 B 2.22 V ☐ D 1.08 V

- 17 Which of the following statements is **not** true about hydrogen bond?

☐ A It causes the helix shape of protein.
☐ B It causes the dimerisation of carboxylic molecules.
☒ C It makes hydrogen chloride gas very soluble in water.
☒ D It makes the boiling point of water exceptionally high.

- 18 The Born-Haber cycle of magnesium fluoride is shown below.



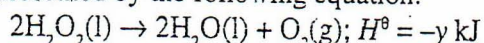
Which of the following contains all positive values of enthalpy changes?

A $\Delta H_1, \Delta H_4, \Delta H_7$ ☒ C $\Delta H_2, \Delta H_3, \Delta H_5$
 B $\Delta H_2, \Delta H_3, \Delta H_6$ ☐ D $\Delta H_3, \Delta H_4, \Delta H_7$

- 19 Which of the following shows the changes in properties of oxides of Group 14 elements (carbon to lead) in the Periodic Table?

☒ A Acidic \rightarrow amphoteric \rightarrow basic
☐ B Acidic \rightarrow basic \rightarrow neutral
☒ C Acidic \rightarrow neutral \rightarrow basic
☐ D Basic \rightarrow amphoteric \rightarrow acidic

- 20 The decomposition of hydrogen peroxide is represented by the following equation:



What is the amount of heat, in kJ, released when 2 g of H_2O_2 is decomposed?

[Relative atomic mass: H = 1; O = 16]

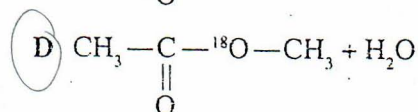
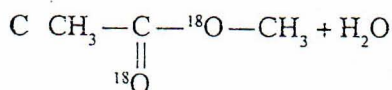
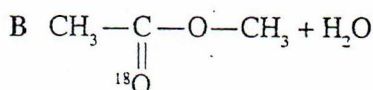
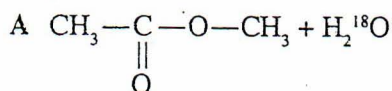
- A $\frac{y}{34.0}$ B $\frac{2y}{34.0}$ C $\frac{34.0}{2y}$ D $\frac{2 \times 34.0}{y}$
- 21 An element has the following sequence of ionisation energies:

595(first), 1152, 4915, 6480,
8150 kJ mol⁻¹

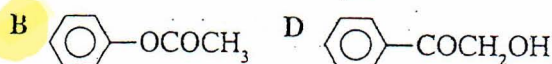
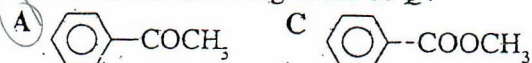
In which group of the Periodic Table is the element most likely located?

- A Group 1 B Group 2 C Group 13 D Group 14
- 22 Which of the following is the correct physical property of elements across the Third Period from sodium to chlorine in the Periodic Table?
- A Size of atoms increases
B Melting point decreases
C Electronegativity decreases
D First ionisation energy increases

- 23 Which of the following structures of esters and water are formed when ethanoic acid is refluxed with methanol enriched in oxygen-18, $\text{CH}_3^{18}\text{OH}$?





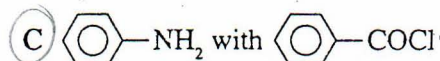
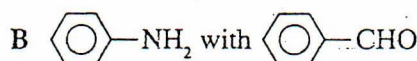
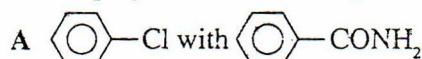
- 24 An organic compound Q is refluxed with a dilute acid. The liquid produced forms a white precipitate when excess bromine water is added. Which of the following could be Q?



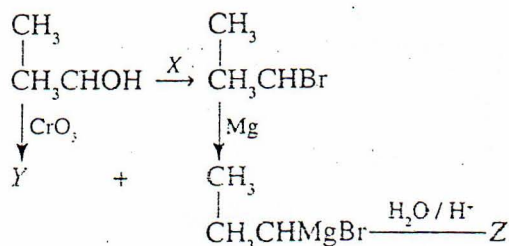
- 25 Which of the following are steps involved in the preparation of 1,2-dibromobutane from butan-1-ol?

- A Dehydration followed by addition.
B Dehydration followed by oxidation.
C Oxidation followed by hydrolysis.
D Hydrolysis followed by addition.

- 26 N-phenylbenzamide, -NHCO-, can be prepared from reacting



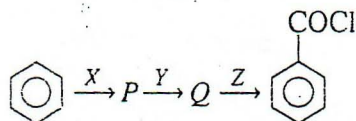
The following scheme shows the production of compound Z from propan-2-ol.



- 27 Which of the following could be X, Y, and Z?

	X	Y	Z
A	Br ₂	$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3\text{C}=\text{O} \end{array}$	$\begin{array}{c} \text{CH}_3 \quad \text{CH}_3 \\ \quad \\ \text{CH}_3\text{CH}-\text{C}-\text{CH}_3 \\ \\ \text{OH} \end{array}$
B	Br ₂	$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3\text{C}=\text{O} \end{array}$	$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3\text{CHCH}_2\text{CH}_2\text{CH}_2\text{OH} \end{array}$
C	PBr ₃	$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3\text{C}=\text{O} \end{array}$	$\begin{array}{c} \text{OH} \quad \text{CH}_3 \\ \quad \\ \text{CH}_3\text{CH}-\text{C}-\text{CH}_3 \\ \\ \text{CH}_3 \end{array}$
D	PBr ₃	$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3\text{C}=\text{O} \end{array}$	$\begin{array}{c} \text{CH}_3 \quad \text{CH}_3 \\ \quad \\ \text{CH}_3\text{CH}-\text{C}-\text{CH}_3 \\ \\ \text{OH} \end{array}$

28 Consider the following sequence of reactions:



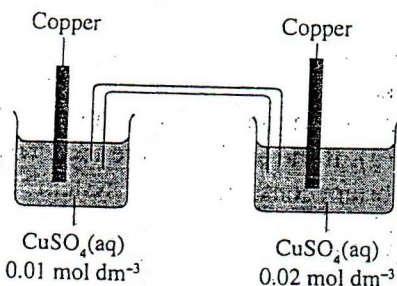
Which of the following sets of compounds could be reagents X, Y, and Z?

	X	Y	Z
A	Cl ₂	KMnO ₄	HCl
B	CH ₃ Cl	NaOH	PCl ₅
C	HNO ₃	CH ₃ COCl	K ₂ Cr ₂ O ₇
D	CH ₃ Br	KMnO ₄	PCl ₅

29 For a general electrochemical cell reaction, $aA + bB \rightleftharpoons cC + dD$, the Nernst equation for cell potential is given by

$$E_{\text{cell}} = E_{\text{cell}}^{\ominus} - \frac{0.059}{n} \log \frac{[C]^c [D]^d}{[A]^a [B]^b}$$

where n is the number of moles of electron transferred. What is the cell potential of the concentration cell below?



- A 0.07 V
B -0.07 V
C 1.10 V
D 0.14 V

30 The solubility product, K_{sp} , of magnesium hydroxide in pure water at 25 °C is $2 \times 10^{-11} \text{ mol}^3 \text{ dm}^{-9}$. What is the solubility of magnesium hydroxide when excess solid magnesium hydroxide is shaken with 1 dm³ of 0.1 mol dm⁻³ sodium hydroxide?

- A $2 \times 10^{-13} \text{ mol dm}^{-3}$
B $4 \times 10^{-12} \text{ mol dm}^{-3}$
C $4 \times 10^{-11} \text{ mol dm}^{-3}$
D $2 \times 10^{-9} \text{ mol dm}^{-3}$

31 The decomposition temperature of magnesium carbonate is lower than that of barium carbonate. Which of the following statements explains this observation?

- A Higher charge density of magnesium ion.
B Covalent bond in magnesium carbonate is weaker.
C Size of carbonate ion in magnesium carbonate is bigger.
D Charge density of carbonate ion in magnesium carbonate is lower.

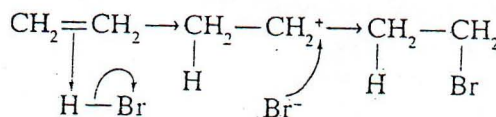
32 Which of the following is the correct name given to a crystalline form of silica?

- A Quartz
B Silicone
C Ceramic
D Mica

33 Which of the following compounds does not give a positive iodoform test?

- A
B
C CH₃COC(CH₃)₃
D CH₃CH₂CH(OH)CH₃

34 The reaction mechanism between ethene and hydrogen bromide is as follows.



Which of the following correctly describes the above mechanism?

- A Nucleophilic addition
B Electrophilic substitution
C Electrophilic addition
D Nucleophilic substitution

35 A compound P has the molecular formula C₅H₁₀O and does not react with alkaline aqueous potassium manganate(VII), but reacts with phosphorus pentachloride with evolution of hydrogen chloride. The structural formula of P is

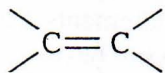
- A CH₃CH₂CH(CH₃)OH
B CH₃C(CH₃)(OH)CH₃
C CH₃CH₂CH₂CH₂OH
D CH₃C(CH₃)OCH₃

36 Which statement about ethanol and propanone is incorrect?

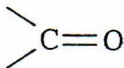
- A Both change the colour of warm acidified potassium dichromate(VI) from orange to green.
B Both may be prepared by the oxidation of ethanol.
C Both give positive iodoform test.
D Both forms orange precipitate with 2, 4-dinitrophenylhydrazine reagent.

37 Which of the following functional groups is normally attacked by electrophiles only?

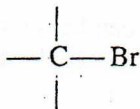
A



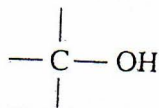
B



C

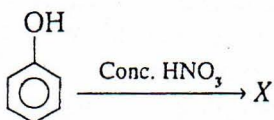


D

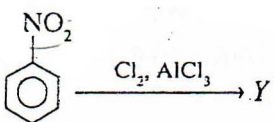


38 Consider two organic reactions below.

I

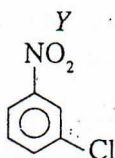
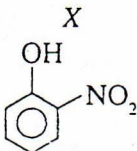


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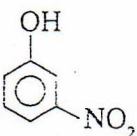


Which of the following compounds represent X and Y respectively?

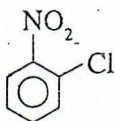
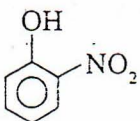
A



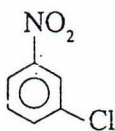
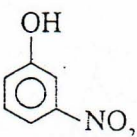
B



C

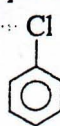


D

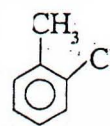


39 Which of the following compounds gives a white precipitate when shaken with a mixture of aqueous silver nitrate and dilute nitric acid?

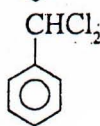
A



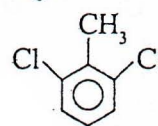
C



B



D



40 Which of the following statements about the reactions of benzoyl chloride is true?

A It reacts with ethanol to form ethyl benzoate.

B It can be oxidised to benzoic acid by using potassium manganate(VII) solution.

C It reacts with water to give phenylmethanol.

D It reacts with nitrous acid to give nitrogen.

Instructions:

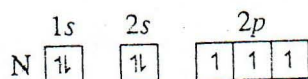
For each of the question in this section, one or more of the three numbered statements 1 to 3 may be correct. The responses A to D should be selected based on the following basis.

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

41 At the anode of an electrolytic cell where electrolysis is taking place, which of the following processes must occur?

- 1 Oxidation
- 2 Loss of electron by anions
- 3 Formation of cations from the anode material

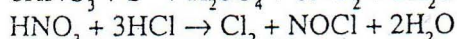
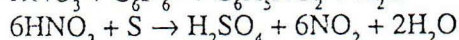
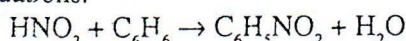
42 The electronic configuration of nitrogen is shown below.



Which of the following statements is true?

- 1 The distribution of electrons obey Hund's rule.
- 2 The nitrogen atom is paramagnetic.
- 3 The filling of electrons into 1s and 2s orbitals follows Pauli Exclusion Principle.

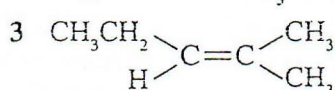
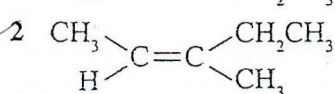
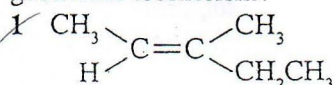
43 Nitric acid reacts with benzene, sulphur, and hydrogen chloride according to the following equations:



The above reaction shows that concentrated nitric acid is acting as

- 1 an acid
- 2 a nitrating agent
- 3 an oxidising agent

44 Which of the following compounds show geometric isomerism?



45 One mole of organic compound W requires 4.5 moles of oxygen gas for complete combustion. W could be

- 1 CH_3COCH_3
- 2 $\text{CH}_3\text{C}=\text{CH}_2$
- 3 $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$

46 Which of the following is an assumption of the kinetic theory of gases?

- 1 Volume of gas molecules can be ignored.
- 2 Attractive forces between molecules can be neglected.
- 3 Collisions between gas molecules are not elastic.

47 Which of the following statements explains why the line emission spectrum of hydrogen is a line spectrum?

- 1 Hydrogen atom has discrete energy levels.
- 2 Electron transition occurs only when certain amount of energy is released.
- 3 Energy levels of hydrogen atom are assigned principle quantum numbers, n .

48 Correct statements about butanone, $\text{CH}_3\text{COCH}_2\text{CH}_3$, include

- 1 can be oxidised to butanoic acid by potassium manganate(VII) solution
- 2 can be prepared from oxidation by butan-2-ol
- 3 forms an addition compound with hydrogen cyanide

49 Which of the following pairs of compounds can react directly to give ethanoic acid?

- 1 NH_3 ; PCl_3
- 2 $\text{CH}_3\text{CH}_2\text{OH}$; NaOH
- 3 HCl ; PCl_3

50 Which of the following reactions involves a nucleophilic attack in the first step?

