CONFIDENTIAL

962/1 STPM TRIAL 2006

MUAR DISTRICT

STPM TRIAL EXAMINATION

CHEMISTRY

PAPER 1

(one hour and forty-five minutes)

Instructions to candidates:

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.

There are **fifty** questions in this paper. For each question, four suggested answers are given. Choose one correct answer and indicate it on the multiple-choice answer sheet provided

Read the instructions on the multiple –choice answer sheet very carefully.

Answer **all** questions. Marks will not be deducted for wrong answers.

This question paper consists of 15 printed pages.

This question paper is CONFIDENTIAL until the examination is over.

Section A

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

1. Which of the following shows the correct content of the particles?
[H: Hydrogen; D: Deuterium; T:Tritium]

	Particle	Number of electrons	Number of protons	Number of neutrons
A	H_3O^+	10	11	11
B	T_3O^+	12	11	14
C	D_3O^+	11	10	12
D	OT^-	10	9	10

2. A sample of magnesium contains traces of magnesium oxide. When the sample is added to 17.6 cm^3 of 2.5 mol dm^{-3} hydrochloric acid, 448 cm^3 of hydrogen at s.t.p are released. What is the mass of magnesium oxide in the sample?

[Relative atomic masses: O= 16, Mg= 24; 1 mol of gas occupies a volume of 22.4 dm^3 at s.t.p.]

A. 0.08g
B. 0.12g
C. 0.16g
D. 0.24g

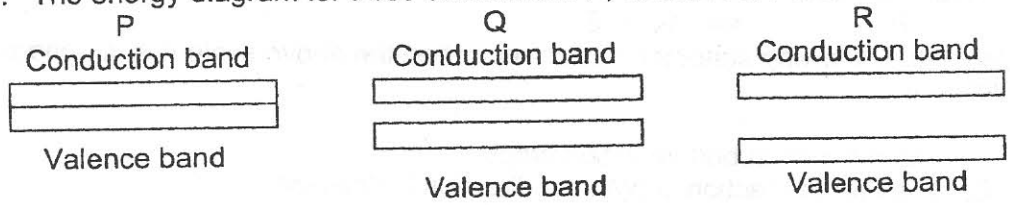
3. Which of the following statements about an ideal gas is incorrect?

A. An ideal gas consists of molecules that move with varying speeds.
B. When gas molecules collide, there is no net loss or gain of kinetic energy.
C. The kinetic energy of a gas molecule remains unchanged when it collides with other molecules.
D. The average kinetic energy of gas molecules is proportional to the absolute temperature.

4. The valence shell electronic configuration of two elements X and Y are respectively $ns^2\ np^3$ and $ns^2\ np^5$. Which of the following represent the formula and type of compound formed between X and Y.

A. XY, covalent
B. XY_2, covalent
C. X_2Y, ion
D. XY_3, covalent

5. The energy diagram for three substances P, Q and R are shown below.



Which of the following combinations is correct?

	P	Q	R
A	Conductor	Non-conductor	Semiconductor
B	Semi-conductor	Non-conductor	Conductor
C	Conductor	Semi-conductor	Non-conductor
D	Non-conductor	Semi-conductor	Semi-conductor

6. Phosphorous forms PCl_3 and PCl_5 while nitrogen forms only NCl_3 and not NCl_5. Which of the following best explain this difference?

A. Phosphorous has more metallic character than nitrogen
B. The size of the phosphorous atom is larger than that of nitrogen
C. Phosphorous is in Group 15 of the Periodic Table whereas nitrogen is in group 13.
D. Phosphorous is in Period 3 of the Periodic Table whereas nitrogen is in Period 2.

7. Which of the following statements about catalyst is true?

A. Catalyst increases the amount of products
B. Catalyst decreases the enthalpy of reactions
C. Catalyst does not take part chemically during the reaction
D. Catalyst changes the mechanism of reaction

8. The following data refers to the reaction:

$$2NO(g) + O_2(g) \longrightarrow 2NO_2(g)$$

[NO]	$[O_2]$	Relative initial rate
1.0	0.5	1.0
2.0	0.5	4.0
2.0	1.0	8.0

The rate equation for the reaction is

A. rate = $k[O_2]$
B. rate = $k[NO_2]^2$
C. rate = $k[NO][O_2]$
D. rate = $k[NO]^2[O_2]$

9. Consider the reversible reaction below:

$$P + Q \;===\; R + S$$

Which of the following statements is correct when the above system is in dynamic equilibrium?

A. The reaction in both direction stops.
B. The rate of reaction in both the direction is different
C. The concentration of P, Q, R and S remain constant
D. The concentration of P, Q, R and S are the same

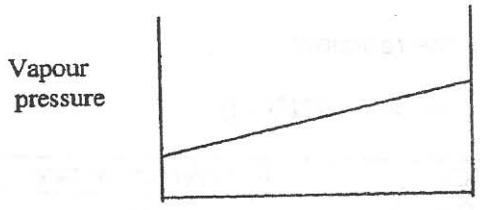
10. The solubility of silver chloride is 1.44×10^{-3} g dm^{-3}. What is the solubility product of silver chloride at the same temperature? [Ag = 108; Cl = 35.5]

A. 1.44×10^{-3} mol^2 dm^{-6}
B. 2.06×10^{-6} mol^2 dm^{-6}
C. 1.00×10^{-10} mol^2 dm^{-6}
D. 1.00×10^{-14} mol^2 dm^{-6}

11. The density of glacial ethanoic acid is 1.05 g cm^{-3}. What is the pH of the solution formed when 2.0 cm^3 of the acid is dissolved in distilled water and the volume made up to 200 cm^3?
[R.a.m : C = 12; H = 1; O = 16. K_a of ethanoic acid = 1.8×10^{-5} mol dm^{-3}]

A. 0.76
B. 2.45
C. 2.75
D. 2.90

12. The vapour pressure-composition curve for a mixture of benzene and methylbenzene is shown below:



When a mixture containing 60% benzene and 40% methylbenzene is fractionally distilled what is the composition of the first distillate and the residue in the flask at the end of the process ?

	First distillate	Residue
A.	benzene	methylbenzene
B.	methylbenzene	benzene
C.	benzene	mixture of benzene and methylbenzene
D.	methylbenzene	mixture of benzene and methylbenzene

13. Consider the Daniel cell below:
$Zn(s) \mid ZnSO_4(aq) \parallel CuSO_4(aq) \mid Cu(s)$
Which of the following statements is **not** correct regarding the cell above?

A. The sulphate ions migrate through the salt bridge from the zinc compartment to the copper compartment
B. The standard e.m.f of the cell is 1.10V
C. The zinc electrode gradually dissolves
D. Electrons flow from zinc to copper through the external circuit

14. Which of the following statements regarding electrolysis is correct?

A. Oxidation occurs at the cathode while reduction occurs at the anode
B. Electrons flow from the cathode to the anode through the external circuit
C. Electrons help to conduct electricity through the electrolyte
D. The ease of cations to be discharged during electrolysis is inversely proportional to the reactivity of the metals.

15. The lattice energy of sodium chloride is -776 kJ mol^{-1}. If the enthalpy of hydration of Na^+ and Cl^- is -390 and -381 kJ mol^{-1}, what is the enthalpy of solution of sodium chloride?

A. +766
B. +5
C. 0
D. -5

16. Which of the following processes can be used as a measure of the strength of the intermolecular forces between the hydrogen halides, HZ (fluorine to iodine) molecules in their liquid state?

A. Enthalpy of formation
B. Enthalpy of vaporization
C. The H—Z bond energy
D. Boiling point

17. Which of the following elements is expected to show the greatest tendency to form some covalent compounds ?

A Barium
B Magnesium
C Calcium
D potassium

18. $AlCl_3$ reacts with $LiAlH_4$ and $(CH_3)_3N$ to give $(CH_3)_3NAlH_3$. Which statement about $(CH_3)_3NAlH_3$ is correct ?

A It is dimeric
B It contains hydrogen bonding
C The Al atom is electron deficient
D The bonds around the Al atom are tetrahedrally arranged

19. Which element has the same oxidation numbers in all of its known compound ?

A Beryllium B Chlorine
C Nitrogen D sulphur

20. A mixture of the oxides of two elements of the third period is dissolved in water. The solution is approximately neutral. What could be the constituents of the mixture ?

A Al_2O_3 and MgO B Na_2O and P_4O_{10}
C Na_2O and MgO D SO_3 and P_4O_{10}

21. The equations for three reactions are given below :

$Cl_2(g) + 2\,H_2O(l) + SO_2(g) \rightarrow 2\,HCl(aq) + H_2SO_4(aq)$

$Cl_2(g) + H_2S(g) \rightarrow 2\,HCl(g) + S(s)$

$2\,H_2S(g) + SO_2(g) \rightarrow 2\,H_2O(l) + 3\,S(s)$

What is the correct order of strength of the three reacting gases as reducing agents?

	Strongest		weakest
A	chlorine	hydrogen sulphide	sulphur dioxide
B	chlorine	sulphur dioxide	hydrogen sulphide
C	hydrogen sulphide	sulphur dioxide	chlorine
D	sulphur dioxide	hydrogen sulphide	chlorine

22. Group VII elements and their hydrogen compounds exhibit trends in properties. Which of these properties increases down the group Cl Br I?

A the hydrogen-halogen bond dissociation energy.
B the strength of the van der Waal's forces between halogen molecules.
C the oxidizing power of the elements.
D the thermal stability of hydrogen halides.

23. When concentrated sulphuric acid is added to separate solid samples of sodium chloride, sodium bromide and sodium iodide, which set of halogen-containing substances is produced ?

A Cl_2, Br_2 and I_2 only
B HCl, Br_2 and I_2 only
C HCl, HBr and HI only
D HCl, HBr, HI, Br_2 and I_2 only

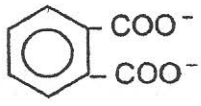
24. The anti-cancer drug cisplatin has the formula $Pt(NH_3)_2Cl_2$. In the human body, one of the chloride ions of cisplatin is replaced by one water molecule.

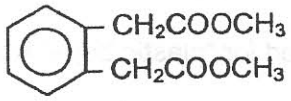
$$Pt(NH_3)_2Cl_2 + H_2O \rightarrow [Pt(NH_3)_2(H_2O)Cl]^+ + Cl^-$$

What is the oxidation number of platinum in each of these substances ?

	Cisplatin	In the aquacomplex
A	+2	+1
B	+2	+2
C	+4	+3
D	+4	+4

25. Which of the following compounds will react with alkaline aqueous iodine to give



A.


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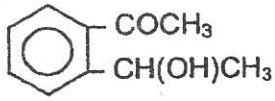

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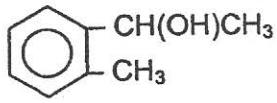

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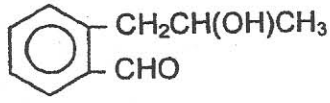


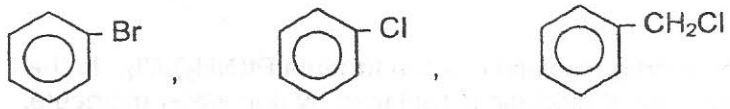
26. If ethanoic acid has a pKa of 4.7. Which of the following compounds will have a pKa value higher than 4.7?

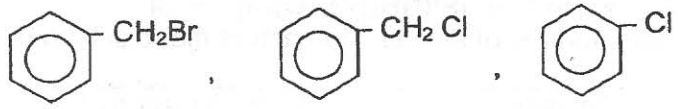
A. C_6H_5OH
B. HCOOH
C. $ClCH_2COOH$
D. C_6H_5COOH

27. Which sequence shows the correct order of **decreasing** ease of hydrolysis?

A. CH_3CH_2Cl , CH_3CH_2Br , CH_3CH_2I

B. $(CH_3)_2CHCl$, $(CH_3)_2CHI$, $(CH_3)_2CHBr$

C. 

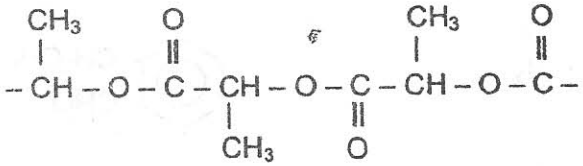
D. 

28. A mixture is made by adding together one mole of sodium hydroxide, one mole of phenol (C_6H_5OH) and one mole of hexan-1-ol($C_6H_{13}OH$), each solute being in aqueous solution.

Which organic species are present in the final solution?

A mainly C_6H_5OH and $C_6H_{13}OH$
B mainly $C_6H_{13}OH$ and $C_6H_5O^-Na^+$
C mainly C_6H_5OH and $C_6H_{13}O^-Na^+$
D approximately equal quantities of C_6H_5OH, $C_6H_5O^-Na^+$, $C_6H_{13}OH$ and $C_6H_{13}O^-Na^+$

29. One form of the biodegradable polymer, used for "plastic bags" has the following structure.



What would be the monomer for this polymer?

A. $CH_3CHCOOH$ (OH)

B. $CH_3CHCOOH$ (Cl)

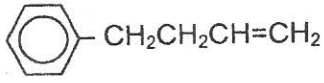
C. CH_3CH_2COCl

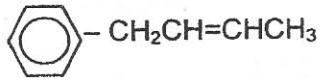
D. CH_3CHCHO (OH)

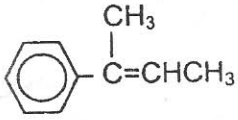
30. Compound X

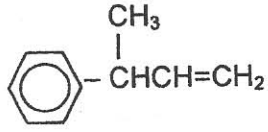
- has the molecular formula $C_{10}H_{14}O$
- is unreactive towards mild oxidising agents.

What is the structure of the compound formed by dehydration of X?

A. 

B. 

C. 

D. 

31. Compound X changes the colour of acidified sodium dichromate(VI) from orange to green. 1 mol of x reacts with 2 mol of HCN(g).

What could X be?

A $CH_3COCH_2COCH_3$
B $OHCCH_2CH_2CHO$
C $CH_3CHBrCH_2CHO$
D $CH_3CHBrCH_2CH_2Br$

32. Which compound could not be obtained from cracking a sample of nonane?

A $CH_3CH=CHCH=CHCH_2CH_2CH_2CH_3$
B $CH_3CH_2CH_2CH_2CH_3$
C $CH_3CH_2CH_2CH_2CH=CH_2$
D $(CH_3CH_2CH_3)_3CH$

33. Ethene reacts with aqueous bromine to give two products, CH_2BrCH_2Br and CH_2BrCH_2OH.

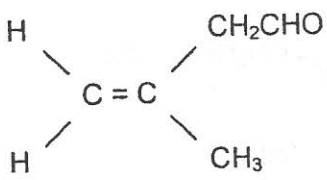
Which statement is correct for these products?

A Both products can be hydrolysed to form the same diol.
B Both products can form hydrogen bonds with water.
C Both products are obtained in this reaction by electrophilic substitution.
D Both products are obtained in this reaction by nucleophilic addition.

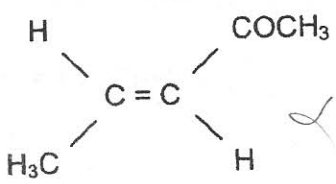
34. Compound P displays cis-trans isomerism and gives a red-brown precipitate with Fehling's solution.

What is P?

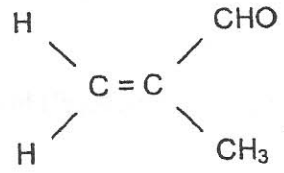
A.



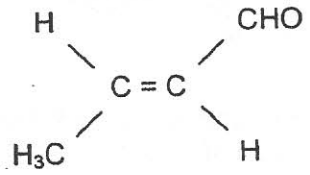
B.



C.



D.



35. During the nitration of benzene, a nitro group substitutes at a carbon atom. What is the arrangement of the bonds at this carbon atom during the reaction?

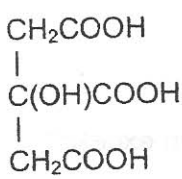
	at the start of the reaction	*In the intermediate complex*	*at the end of the reaction*
A	planar	planar	planar
B	planar	tetrahedral	planar
C	planar	tetrahedral	tetrahedral
D	tetrahedral	tetrahedral	tetrahedral

36. Which pair of reactions could have the same common intermediate?

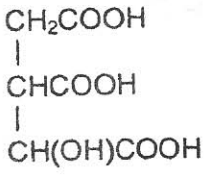
W : $CH_3CH_2CH_3 \longrightarrow$ intermediate $\longrightarrow (CH_3)_2CHCN$
X : $CH_3CH(OH)CH_3 \longrightarrow$ intermediate $\longrightarrow (CH_3)_2C(OH)CN$
Y : $CH_3CH{=}CH_2 \longrightarrow$ intermediate $\longrightarrow CH_3CH(OH)CH_3$
Z : $CH_3COOCH_2CH_2CH_3 \longrightarrow$ intermediate $\longrightarrow CH_3CH_2CH_2Br$

A. W and X
B. W and Y
C. X and Z
D. Y and Z

37. The isomers, citric acid and isocitiric acid, are intermediates in the Krebs cycle of the oxidation of glucose in living cells.



Citric acid



isocitric acid

How many chiral centers does each acid possess?

	citric acid	isocitirc acid
A	1	2
B	1	1
C	0	2
D	0	1

38. The compound hex-3-en-1-ol, P, has a strong 'leafy' smell of newly cut grass and is used in perfumery.

P: $CH_3CH_2CH{=}CHCH_2CH_2OH$

What is produced when P is treated with an excess of hot concentrated acidic $KmnO_4$?

A $CH_3CH_2CH(OH)CH(OH)CH_2CH_2OH$
B $CH_3CH_2CH{=}CHCH_2COOH$
C CH_3CH_2COOH and $HO_2CCH_2CO_2H$
D CH_3CH_2CHO and $OCHCH_2CH_2CHO$

39. Chlorofluoroalkanes, commonly known as CFC's undergo hemolytic fission by ultraviolet irradiation in the stratosphere.

Which radical could result from this irradiation of $CHFClCF_2Cl$?

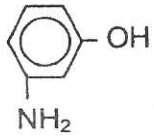
A. $CHFCl\dot{C}FCl$

B. $\dot{C}HClCF_2Cl$

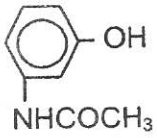
C. $\dot{C}HFCF_2Cl$

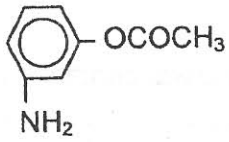
D. $\dot{C}FClCF_2Cl$

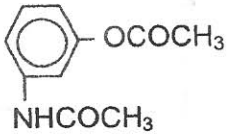
40. The compound below reacts with ethanoyl chloride.

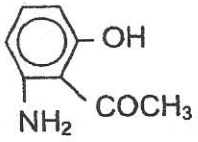


What is the formula of the product when the ethanoyl chloride is in excess?

A. 

B. 

C. 

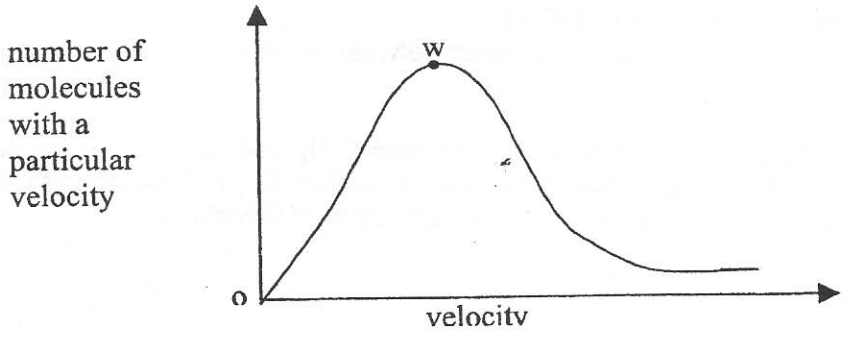
B. 

Section B

For each of the questions in this section one or more of the three numbered statements **1** *to* **3** *may be correct. Determine which of the statements is correct. The responses* **A** *to* **D** *should be selected on the basis of the following.*

A	B	C	D
ONLY 1 IS CORRECT	1 AND 2 ARE CORRECT	2 AND 3 ARE CORRECT	1,2 AND 3 ARE CORRECT

41. The following graph shows the Boltzman distribution for the molecular velocity of a gas sample at a particular temperature.



Which of the following statements related to the above graph is/are true?

1 When the temperature decrease, the area below the graph will decrease.
2 When the temperature increase, the point W will shift to the right.
3 The area below the graph is proportional to the number of molecules in the gas sample.

42. The table below shows the equilibrium constants at different temperatures for the reaction

$$N_2O_4\ (g) \rightleftharpoons 2NO_2(g)$$

light yellow brown

Temperature / K	Equilibrium constant K_p
600	1.78×10^4 kPa
1000	2.82×10^4 kPa

The above information shows that:

1 Dissociation of dinitrogen tetroxide is an endotermic process.
2 When temperature increase, the colour intensity of the gas mixture will increase.
3 Increase in pressure will shift the equilibrium position to the left.

A	B	C	D
ONLY 1 IS CORRECT	1 AND 2 ARE CORRECT	2 AND 3 ARE CORRECT	1,2 AND 3 ARE CORRECT

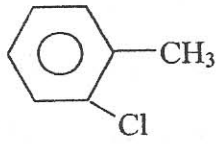
43. Which of the following molecules undergoes sp^2 hybridisation?

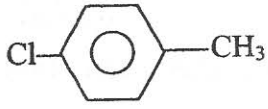
1 SO_2 2 HCN 3 C_2H_6

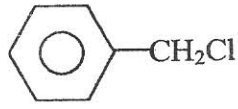
44. Which of the following is true about an acid-base indicator?

1 The ions and molecules in the indicator must have different colour
2 It must change colour at pH=7
3 It can only be used for the titration between a strong acid and a strong base.

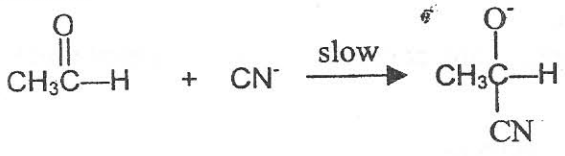
45. A hydrocarbon , P , with molecular formula C_7H_8, reacts with chlorine gas in the presence of iron(III) chloride, $FeCl_3$ as catalyst. A product, Q , with molecular formula C_7H_7Cl, is produced. The possible structural formula(e) of Q includes

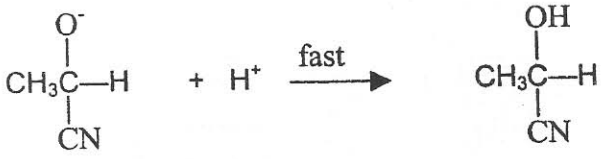
1 

2 

3 

46. The mechanism for the reaction between ethanal and hydrogen cyanide is summarized below:





This means,

1 addition of acid can increase the rate of the above reaction.
2 the reaction becomes very fast in the presence of alkali.
3 the reaction is a second order reaction.

A	B	C	D
ONLY 1 IS CORRECT	1 AND 2 ARE CORRECT	2 AND 3 ARE CORRECT	1,2 AND 3 ARE CORRECT

47. Phenol and phenylmethanol react similarly with

1 Bromine water
2 Ethanoyl chloride
3 Sodium metal

48. The ester with structural formula

$CH_3CH_2CH_2COOCH(CH_3)_2$

can be synthesized by the reaction between

1 butanoyl chloride and propan-2-ol
2 butanoic acid and propan-1-ol.
3 propanoyl chloride and propan-2-ol

49. Cobalt form a complex with formula $[Co(H_2NCH_2CH_2NH_2)_2Cl_2]^+$. This complex

1 contains cobalt with an oxidation number= +1
2 can exist as geometrical isomers.
3 can exist as optical isomers.

50. Which of the properties of group 14 elements will increase with the increase in proton number?

1 The metallic property
2 The stability of the tetrachloride
3 The first ionization energy.