



الدور الثاني - الفصل الدراسي الأول

- تنبيه:**
- المادة: الكيمياء.
 - الأسئلة في (١٤) صفحة.

- يجب الحضور إلى قاعة الامتحان قبل عشر دقائق على الأقل من بدء زمن الامتحان.
- يجب إحضار أصل ما يثبت الهوية وإبرازها للعاملين بالامتحانات.
- يجب الالتزام بالزي (الدشداشة البيضاء والمصر أو الكمة للذكور) والزي المدرسي للطالبات ، ويستثنى من ذلك الدارسون من غير العمانيين بشرط الالتزام بالذوق العام، ويمنع على جميع المتقدمات ارتداء النقاب داخل المركز وقاعات الامتحان.
- يحظر على الممتحنين اصطحاب الهواتف النقالة وأجهزة النداء الآلي وآلات التصوير والحواسيب الشخصية والساعات الرقمية الذكية والآلات الحاسبة ذات الصفة التخزينية والمجلات والصحف والكتب الدراسية والدفاتر والمذكرات والحقائب اليدوية والآلات الحادة أو الأسلحة أيّاً كان نوعها وأي شيء له علاقة بالامتحان.
- يجب على الممتحن الامتثال لإجراءات التفتيش داخل المركز طوال أيام الامتحان.



مُسَوَّدَة، لا يتم تصحيحها

Question 1: Multiple Choice Items**(14 marks)**

There are 14 multiple-choice items worth one marks each.

Shade in the bubble (☐) next to the **correct** answer for each of the following items.

- 1) Which of the following transition elements has the highest oxidation state in its complexes?

☐ Zn☐ Cr☐ Mn☐ Fe

- 2) Which of the following is correct about $\text{Fe}(\text{C}_2\text{O}_4)_3^{3-}$ complex ion?

☐ Six-membered ring formed between ligand $\text{C}_2\text{O}_4^{2-}$ and iron ion.☐ Six dative covalent bonds are formed in this complex ion.☐ The oxidation number of Fe in this complex ion is +2.☐ $\text{C}_2\text{O}_4^{2-}$ is a monodentate ligand.

- 3) Which options is correct for the complex ion in $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})\text{Cl}]\text{Br}$?

	Oxidation state of Co	Shape of the complex ion	Overall charge of the complex ion
<input type="radio"/>	+2	Octahedral	+2
<input type="radio"/>	+3	Tetrahedral	+2
<input type="radio"/>	+2	Octahedral	+1
<input type="radio"/>	+3	Tetrahedral	+1

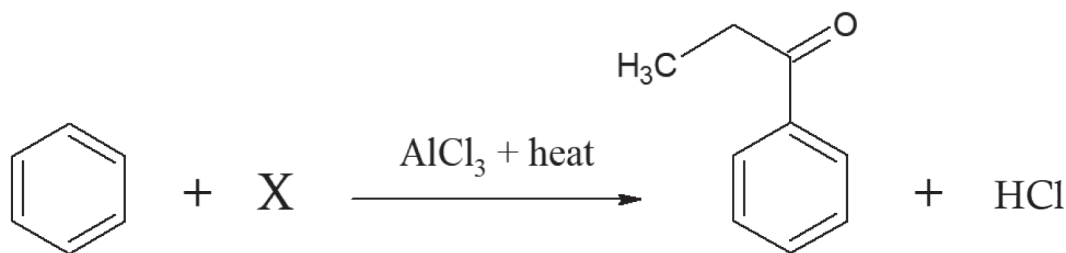
- 4) Which of the following statements is incorrect about phenol?

☐ It is less acidic than alcohols.☐ It contains two functional groups.☐ The C—O bond in it is very strong.☐ It dissolves in aqueous sodium hydroxide.

Do not write in this space

Question 1 continued

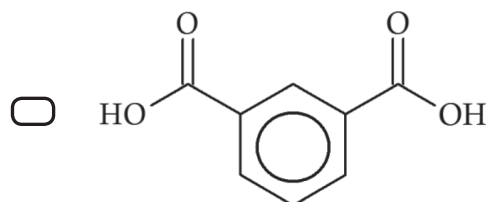
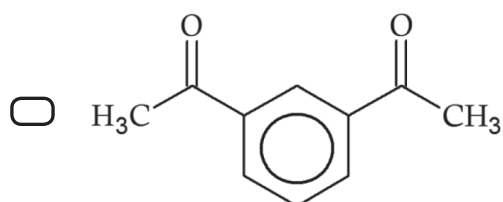
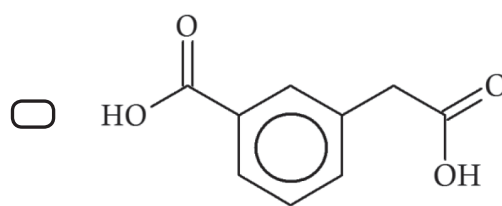
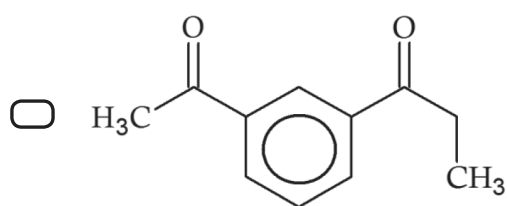
5) For the reaction below:



Which of the following options is correct about the type of the reaction and the reagent X?

	Type of reaction	Reagent X
<input type="radio"/>	Alkylation	$\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$
<input type="radio"/>	Acylation	$\text{CH}_3\text{CH}_2\text{COCl}$
<input type="radio"/>	Alkylation	$\text{CH}_3\text{CH}_2\text{COCl}$
<input type="radio"/>	Acylation	$\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$

6) Which of the following would be a possible organic product from the oxidation of 1-ethyl-3-methylbenzene?



Do not write in this space

Question 1 continued

7) Which of the following statements about the reactions of acyl chlorides is incorrect?

- ☐ They are provided with an easily removed leaving group.
- ☐ They do not depend on the easily polarised double bond $C=O$.
- ☐ Their reactions take place by involving addition followed by elimination.
- ☐ If water is the nucleophile in their reactions, carboxylic acids are formed.

8) For the reaction below:



Which statement describes this reaction correctly?

- ☐ Compound (X) is an acyl chloride.
- ☐ Compound (Y) is a hydrogen gas.
- ☐ Compound (X) cannot be broken down again by compound (Y).
- ☐ Compound (X) reacts slower than $HCl_{(aq)}$ of equal concentration.

9) Methanoic acid (HCO_2H) reacts with a suitable reagent to form CO_3^{2-} . What is the correct option that describes this reaction?

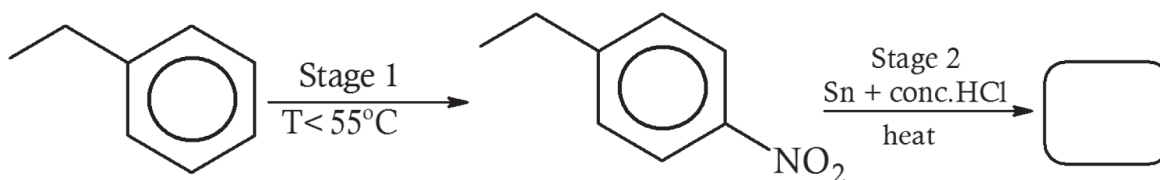
	type of reaction	Reagent used	Other products
<input type="checkbox"/>	reduction	MnO_4^-	Mn^{2+} and H_2O
<input type="checkbox"/>	reduction	Cu^{2+}	Cu_2O and H_2O
<input type="checkbox"/>	oxidation	Cu^{2+}	Cu_2O and H_2O
<input type="checkbox"/>	oxidation	MnO_4^-	Mn^{2+} and H_2O

Question 1 continued

10) Which set of amines shows correct classification?

	Primary	Secondary	Tertiary
<input type="checkbox"/>	$\text{CH}_3\text{CH}_2\text{NH}_2$	$(\text{CH}_3\text{CH}_2)_3\text{N}$	$(\text{CH}_3\text{CH}_2)_2\text{NH}$
<input type="checkbox"/>	$(\text{CH}_3\text{CH}_2)_2\text{NH}$	$\text{CH}_3\text{CH}_2\text{NH}_2$	$(\text{CH}_3\text{CH}_2)_3\text{N}$
<input type="checkbox"/>	$\text{CH}_3\text{CH}_2\text{NH}_2$	$(\text{CH}_3\text{CH}_2)_2\text{NH}$	$(\text{CH}_3\text{CH}_2)_3\text{N}$
<input type="checkbox"/>	$(\text{CH}_3\text{CH}_2)_3\text{N}$	$(\text{CH}_3\text{CH})_2\text{NH}$	$\text{CH}_3\text{CH}_2\text{NH}_2$

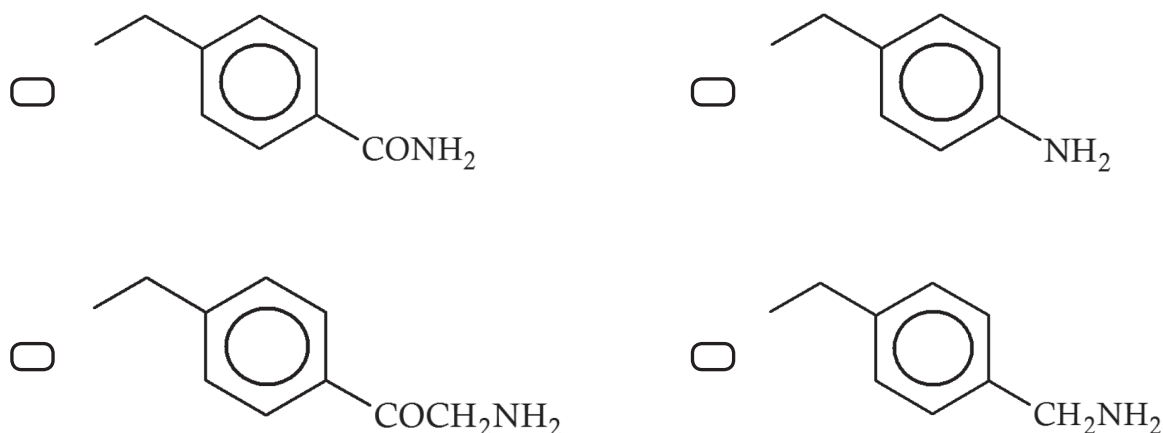
A student carried out two-stage synthesis as shown below, Study it to answer questions 11 and 12.



11) Which of the following reagents are suitable for the first stage?

- ☐ NaCN in ethanol ☐ $\text{conc. HNO}_3 + \text{conc. H}_2\text{SO}_4$
☐ SOCl_2 ☐ LiAlH_4 in dry ether

12) Which of the following compounds would be a possible product for the second stage of this synthesis?



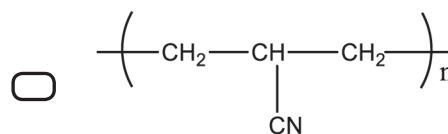
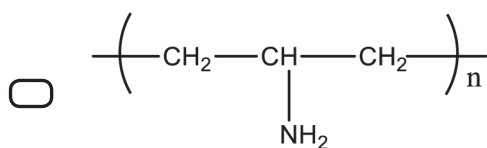
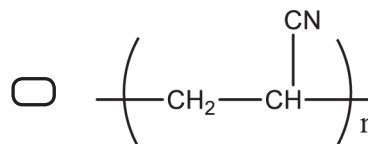
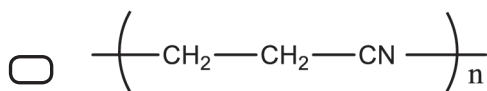
Do not write in this space

Question 1 continued

13) Which of the following statements about polymerisation is incorrect?

- ☐ The monomers that contain double bond undergo addition polymerisation.
- ☐ The repeat units for all polymers come from one monomer.
- ☐ Water is a possible product in condensation polymerisation.
- ☐ If the chain of the polymer contains hetero atoms, the polymer is produced by condensation.

14) Which of the following polymers is formed by polymerisation of the monomer $\text{CH}_2=\text{CH}-\text{CN}$?



Do not write in this space

Question 2: Extended Questions**(56 marks)**

Do not write in this space

Write your answer for each of the following questions in the space provided.
Be sure to show all your work, including the correct units where applicable.

15) a. Transition elements have variable oxidation states.

(i) Explain why transition elements have variable oxidation states.

(ii) What is the highest oxidation state of chromium commonly seen in its compounds?

(iii) What is the lowest oxidation state of chromium commonly seen in its compounds?

(iv) Write the electronic configuration for a chromium atom (Cr) and Cr^{3+} ion.

Cr: _____

Cr^{3+} : _____

(v) Draw the complex ion formed by one Cr^{3+} ion with six NH_3 . Your drawing should clearly show three-dimensional shape and should include the overall charge on the complex ion.

Do not write in this space

Question 2 continued

- b. Six different compounds or complexes, H, J, K, L, M and N, are formed when an excess of aqueous NH_3 , aqueous NaOH and concentrated aqueous HCl are separately added to separate solutions containing $\text{Cu}^{2+}(\text{aq})$ or $\text{Co}^{2+}(\text{aq})$.

Solution	reagent		
	Excess of $\text{NH}_3(\text{aq})$	Excess of $\text{NaOH}(\text{aq})$	Excess of concentrated $\text{HCl}(\text{aq})$
$\text{Cu}^{2+}(\text{aq})$	H	J	K
$\text{Co}^{2+}(\text{aq})$	L	M	N

- (i) Write the colours of the following compounds or complexes.

H _____

K _____

M _____

- (ii) Write the formulae of the following compounds or complexes.

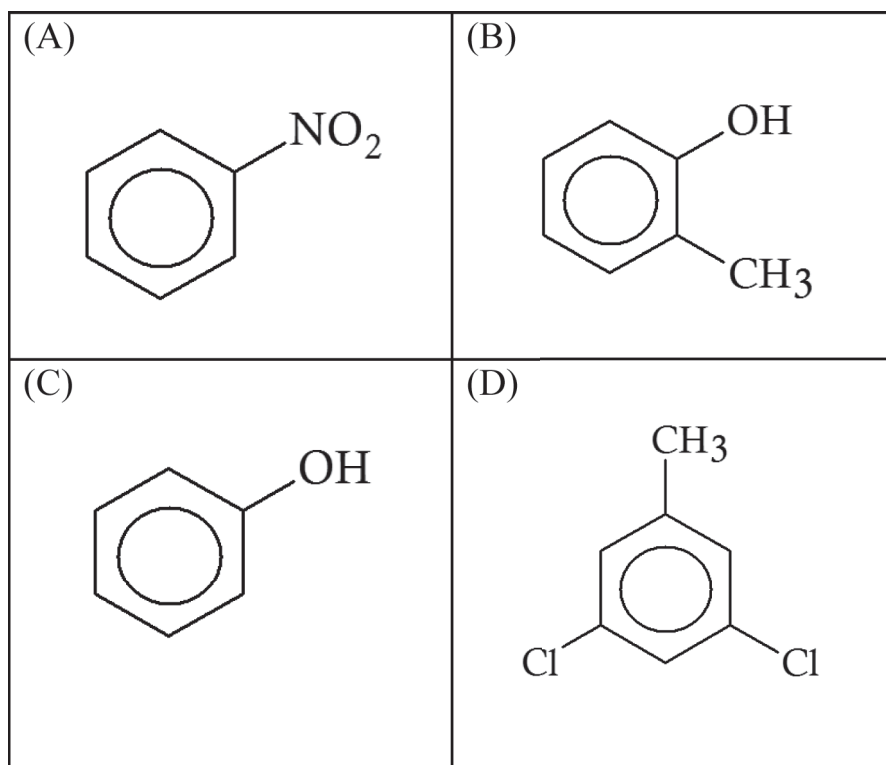
L _____

N _____

Do not write in this space

Question 2 continued

16) Study the following four compounds and answer the questions below.



a. Compound (A) can be formed from benzene by nitration.

(i) State two properties of benzene structural system?

(ii) Draw the structural formula of the carbocation intermediate in the nitration of benzene?

b. Name the following compounds according to IUPAC system.

(i) Compound (B): _____

(ii) Compound (D): _____

Do not write in this space

Question 2 continued

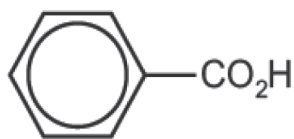
c. Write the chemical reactions for the reaction of compound (C) with:

(i) Na.

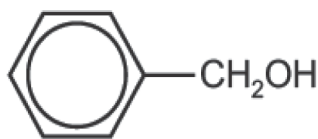
(ii) NaOH.

d. Which one is more reactive with electrophiles, compound (A) or compound (C)? Explain your answer.

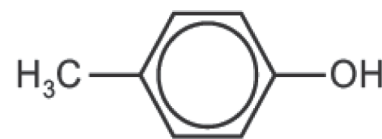
17) Study the three organic compounds below and answer the following questions.



Compound (A)



Compound (B)



Compound (C)

a. What is the IUPAC name of Compound (A)?

b. Compound (A) can react with calcium carbonate to form a salt and two other products. What are these two other products?

c. Compound (A) can react with Compound (B) when adding strong acid with heating under reflux to form new organic product. What is the type of this organic product?

Do not write in this space

Question 2 continued

Do not write in this space

- d. Which compound (A, B or C) has the extra electron-withdrawing effect, in extra dipole-dipole attraction?

- e. Write the order of the relative acidities of the three organic compounds from the weakest to the strongest.

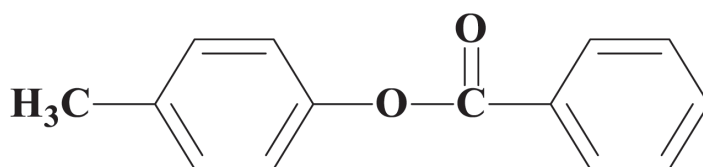
_____ < _____ < _____
(weakest) → (strongest)

- f. If the -Cl group is added on the opposite side of the benzene ring to the -CO₂H group of compound (A), what will be the effect on pK_a for compound (A). Explain your answer.

The effect: _____

Explanation: _____

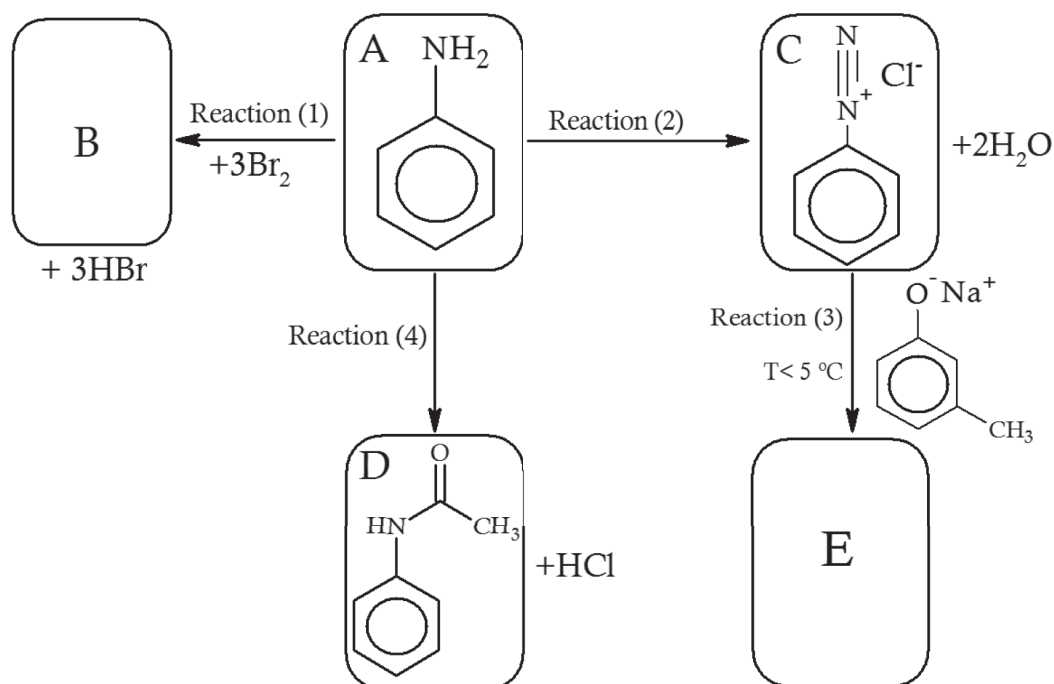
- g. Starting with reaction of Compound (A) with PCl₅ show the two-stage synthesis of the ester (4-methylphenyl benzoate) shown below through an acyl chloride using the chemical equations and suitable reagents and conditions. (Hint: also use Compound (C)).



Do not write in this space

Question 2 continued

- 18) A sequence of four chemical reactions was carried out as follows. Study it and answer the following questions.



a. Identify the following:

- The class of Compound (A): _____
- The class of Compound (D): _____
- The name of reaction (2): _____

b. What are the reagents and conditions needed for:

- Reaction (2): _____
- Reaction (4): _____

c. Draw the structural formulae of the following Compounds:

- Compound (B): _____
- Compound (E): _____

Do not write in this space

Question 2 continued

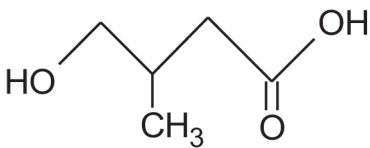
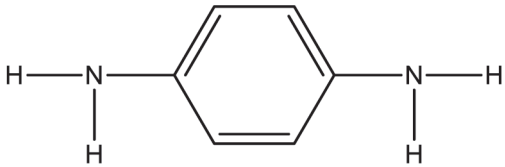
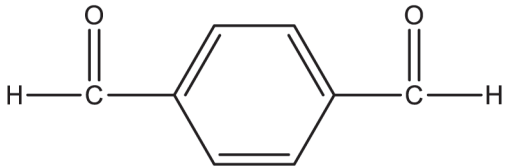
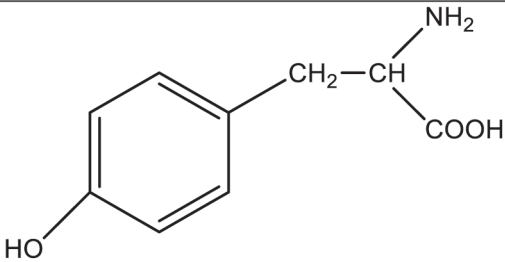
d. For compound (D):

(i) What is the type of bond between its molecules?

(ii) Write the products for the hydrolysis of compound (D) in NaOH?

e. Which one is less basic, compound (A) or ammonia. Explain your answer.

19) The following grid shows six monomers. Study it to answer the questions below.

 <p>(A)</p>	$\text{H}_2\text{NCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{NH}_2$ <p>(B)</p>
 <p>(C)</p>	 <p>(D)</p>
 <p>(E)</p>	$\text{HOOCCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{COOH}$ <p>(F)</p>

Do not write in this space

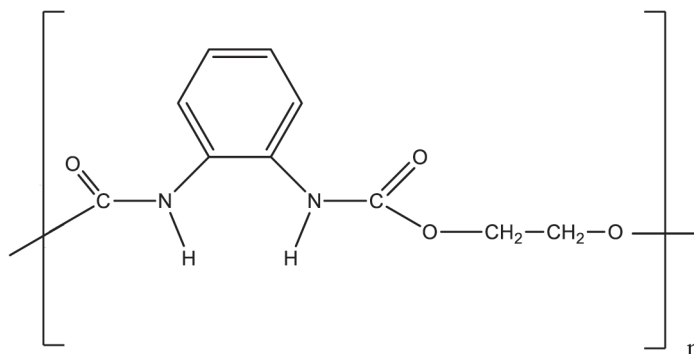
Question 2 continued

- a. What is the functional group found in the polymer formed by condensation of monomer (A)?
- _____
- b. Which two monomers are used to produce Kevlar polymer?
- _____
- _____
- c. Write the structural formula of the polymer formed from monomers (B) and (F).
- _____
- _____
- d. What is the name of the polymer formed from monomers (B) and (F)?
- _____
- e. Which monomer, (C or D) can form a polymer with monomer (B) by condensation? Explain your answer.
- _____
- _____

Do not write in this space

Question 2 continued

20) Study the following polymer to answer the questions below.



a. What is meant by peptide bond?

b. Draw the structural formula(e) of the monomer(s) used to form this polymer.

c. What is the type of polymerisation in this polymer?

[End of Examination]

Do not write in this space

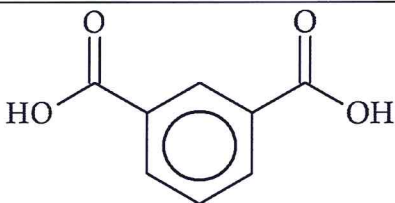
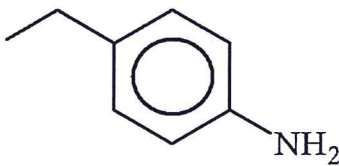
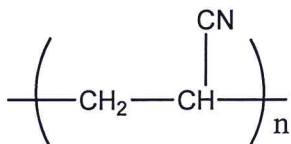
1 H 1.008 Hydrogen	2 He 4.002602 Helium	<div> <div>Atomic Number → 1</div> <div> <div>Symbol →</div> <div>H</div> </div> <div> <div>1.008 ←</div> <div>Atomic Mass</div> </div> <div> <div>Hydrogen ←</div> <div>Name</div> </div> </div>																3 Li 6.94 Lithium	4 Be 9.0121831 Beryllium	5 B 10.81 Boron	6 C 12.011 Carbon	7 N 14.007 Nitrogen	8 O 15.999 Oxygen	9 F 18.998403163 Fluorine	10 Ne 20.1797 Neon	11 Na 22.98976928 Sodium	12 Mg 24.305 Magnesium	13 Al 26.9815385 Aluminium	14 Si 28.085 Silicon	15 P 30.973761998 Phosphorus	16 S 32.06 Sulfur	17 Cl 35.45 Chlorine	18 Ar 39.948 Argon	19 K 39.0983 Potassium	20 Ca 40.078 Calcium	21 Sc 44.955908 Scandium	22 Ti 47.867 Titanium	23 V 50.9415 Vanadium	24 Cr 51.9961 Chromium	25 Mn 54.938044 Manganese	26 Fe 55.845 Iron	27 Co 58.933194 Cobalt	28 Ni 58.6934 Nickel	29 Cu 63.546 Copper	30 Zn 65.38 Zinc	31 Ga 69.723 Gallium	32 Ge 72.630 Germanium	33 As 74.921595 Arsenic	34 Se 78.971 Selenium	35 Br 79.904 Bromine	36 Kr 83.798 Krypton	37 Rb 85.4678 Rubidium	38 Sr 87.62 Strontium	39 Y 88.90584 Yttrium	40 Zr 91.224 Zirconium	41 Nb 92.90637 Niobium	42 Mo 95.95 Molybdenum	43 Tc 98 Technetium	44 Ru 101.07 Ruthenium	45 Rh 102.90550 Rhodium	46 Pd 106.42 Palladium	47 Ag 107.8682 Silver	48 Cd 112.414 Cadmium	49 In 114.818 Indium	50 Sn 118.710 Tin	51 Sb 121.760 Antimony	52 Te 127.60 Tellurium	53 I 126.90447 Iodine	54 Xe 131.293 Xenon	55 Cs 132.90545196 Caesium	56 Ba 137.327 Barium	57 La 138.9047 Lanthanum	58 Ce 140.12 Cerium	59 Pr 140.90765 Praseodymium	60 Nd 144.242 Neodymium	61 Pm 144.9127 Promethium	62 Sm 150.36 Samarium	63 Eu 151.964 Europium	64 Gd 157.25 Gadolinium	65 Tb 158.925 Terbium	66 Dy 162.5003 Dysprosium	67 Ho 164.93032 Holmium	68 Er 167.259 Erbium	69 Tm 168.93032 Thulium	70 Yb 173.054 Ytterbium	71 Lu 174.967 Lutetium	72 Hf 178.49 Hafnium	73 Ta 180.94788 Tantalum	74 W 183.84 Tungsten	75 Re 186.207 Rhenium	76 Os 190.23 Osmium	77 Ir 192.217 Iridium	78 Pt 195.084 Platinum	79 Au 196.966569 Gold	80 Hg 200.592 Mercury	81 Tl 204.38 Thallium	82 Pb 207.2 Lead	83 Bi 208.98040 Bismuth	84 Po 209 Polonium	85 At 210 Astatine	86 Rn 222 Radon	87 Fr 223 Francium	88 Ra 226 Radium	89 Ac 227 Actinium	90 Th 232.0377 Thorium	91 Pa 231.036889 Protactinium	92 U 238.02891 Uranium	93 Np 237.048173 Neptunium	94 Pu 244.06422 Plutonium	95 Am 243.061381 Americium	96 Cm 247.070353 Curium	97 Bk 247.070353 Berkelium	98 Cf 251.083288 Californium	99 Es 252.083288 Einsteinium	100 Fm 257.103712 Fermium	101 Md 258.103712 Mendelevium	102 No 259.103712 Nobelium	103 Lr 262.103712 Lawrencium	104 Rf 261 Rutherfordium	105 Db 268 Dubnium	106 Sg 269 Seaborgium	107 Bh 270 Bohrium	108 Hs 269 Hassium	109 Mt 278 Meitnerium	110 Ds 281 Darmstadtium	111 Rg 281 Roentgenium	112 Cn 285 Copernicium	113 Nh 284 Nihonium	114 Fl 289 Flerovium	115 Uup 289 Ununpentium	116 Lv 293 Livermorium	117 Uus 294 Ununseptium	118 Uuo 294 Ununoctium	119 Ts 294 Tennessine	120 Og 294 Oganesson
-----------------------------	-------------------------------	---	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	----------------------------	-----------------------------------	--------------------------	----------------------------	------------------------------	----------------------------	------------------------------------	-----------------------------	-----------------------------------	---------------------------------	-------------------------------------	-------------------------------	---------------------------------------	----------------------------	-------------------------------	-----------------------------	---------------------------------	-------------------------------	-----------------------------------	--------------------------------	--------------------------------	---------------------------------	------------------------------------	----------------------------	---------------------------------	-------------------------------	------------------------------	---------------------------	-------------------------------	---------------------------------	----------------------------------	--------------------------------	-------------------------------	-------------------------------	---------------------------------	--------------------------------	--------------------------------	---------------------------------	---------------------------------	---------------------------------	------------------------------	---------------------------------	----------------------------------	---------------------------------	--------------------------------	--------------------------------	-------------------------------	----------------------------	---------------------------------	---------------------------------	--------------------------------	------------------------------	-------------------------------------	-------------------------------	-----------------------------------	------------------------------	---------------------------------------	----------------------------------	------------------------------------	--------------------------------	---------------------------------	----------------------------------	--------------------------------	------------------------------------	----------------------------------	-------------------------------	----------------------------------	----------------------------------	---------------------------------	-------------------------------	-----------------------------------	-------------------------------	--------------------------------	------------------------------	--------------------------------	---------------------------------	--------------------------------	--------------------------------	--------------------------------	---------------------------	----------------------------------	-----------------------------	-----------------------------	--------------------------	-----------------------------	---------------------------	-----------------------------	---------------------------------	--	---------------------------------	-------------------------------------	------------------------------------	-------------------------------------	----------------------------------	-------------------------------------	---------------------------------------	---------------------------------------	------------------------------------	--	-------------------------------------	---------------------------------------	-----------------------------------	-----------------------------	--------------------------------	-----------------------------	-----------------------------	--------------------------------	----------------------------------	---------------------------------	---------------------------------	------------------------------	-------------------------------	----------------------------------	---------------------------------	----------------------------------	---------------------------------	--------------------------------	-------------------------------

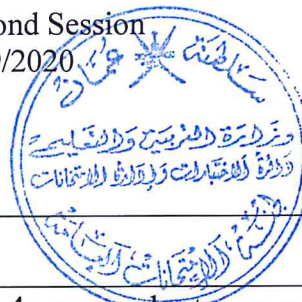
Actinide
Series

TOTAL MARKS: 70

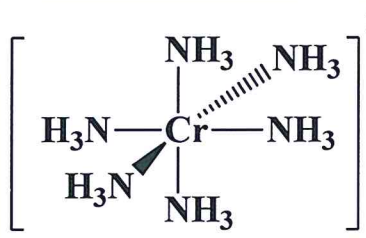
Question One (28 Marks)

There are 14 multiple-choice items. Each correct answer is worth ONE marks.

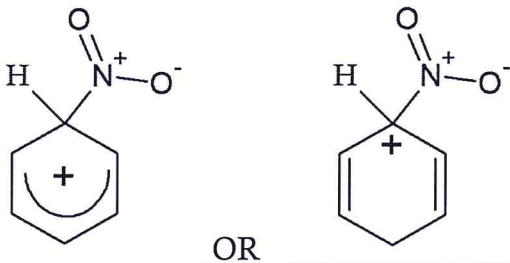
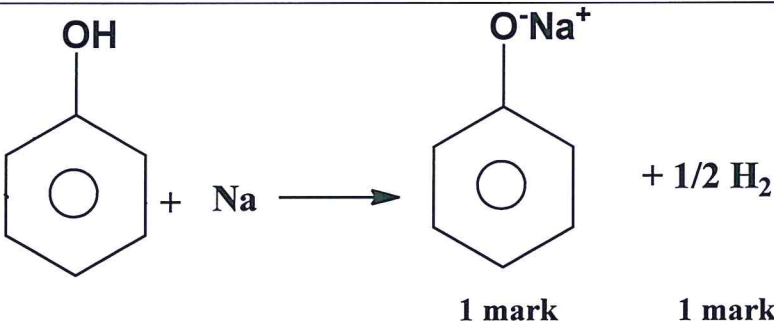

Item No.	Correct option
1	c. Mn.
2	b. Six dative covalent bonds are formed in this complex ion.
3	c. +2 Octahedral +1
4	a. It is less acidic than alcohols.
5	b. Acylation $\text{CH}_3\text{CH}_2\text{COCl}$
6	d. 
7	b. They do not depend on the easily polarised double bond $\text{C}=\text{O}$.
8	d. Compound (X) reacts slower than $\text{HCl}_{(\text{aq})}$ of equal concentration.
9	c. oxidation Cu^{2+} Cu_2O and H_2O
10	c. $\text{CH}_3\text{CH}_2\text{NH}_2$ $(\text{CH}_3\text{CH}_2)_2\text{NH}$ $(\text{CH}_3\text{CH}_2)_3\text{N}$
11	b. conc. HNO_3 + conc. H_2SO_4
12	b. 
13	b. The repeat unit for all polymers comes from one monomer.
14	b. 



Question Two (56 Marks)

<u>Part</u>	<u>Section</u>	<u>The answer</u>	<u>The mark</u>
15	a.i	Because the transition elements can lose the 4s or ns electrons and some or all of the 3d or n-1d electrons.	1 mark
	a.ii	+6	1 mark
	a.iii	+3	1 mark
	a.iv	Cr atom $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$ or $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^5$ or $[Ar] 3d^5 4s^1$ or $[Ar] 4s^1 3d^5$ (1mark) Cr ³⁺ ion $1s^2 2s^2 2p^6 3s^2 3p^6 3d^3$ or $[Ar] 3d^3$ (1mark)	2 mark
	a.v	 <p>-1mark for drawing the three-dimensional shape (the octahedral shape) of the complex ion.</p> <p>-1mark for writing the correct overall charge on the complex ion (3+).</p>	2 mark
	b.i	H is deep / dark / royal and blue (solution) K is yellow / yellow-green M is blue (precipitate) (allow pink) -Each answer is worth 1 mark.	3 mark
	b.ii	L is $[Co(NH_3)_6]^{2+}$ N is $[CoCl_4]^{2-}$ -Each answer is worth 1 mark.	2 mark

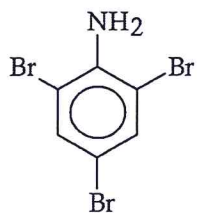
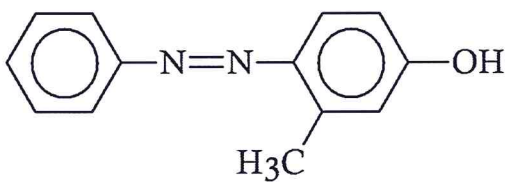
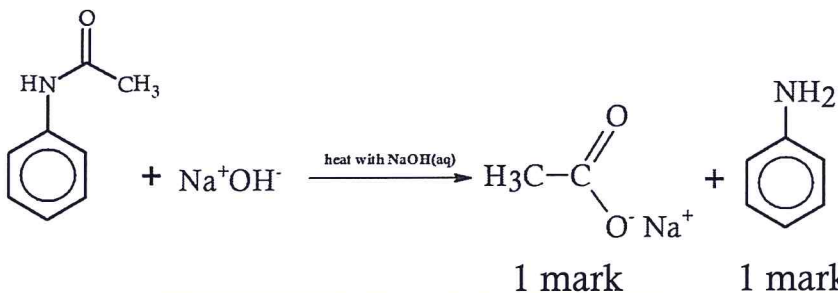


Part	Section	The answer	The mark
16	a.i	<ul style="list-style-type: none"> - Six carbon atoms arranged in a planar, regular hexagon. - Each carbon atom joined to a hydrogen atom and to its neighbours carbon by σ bonds. - There are six spare p orbitals, one on each carbon atom. - All the bond angles are 120°. - All the C—C bonds have the same length. <p>Any two correct answers from above mark is given</p>	2 marks
	a.ii	 <p>OR</p>	1 mark
	b.i	2-methylphenol.	1 mark
	b.ii	3,5-dichloromethylbenzene or 3,5-dichlorotoluene	1 mark
	c.i	 <p style="text-align: center;">1 mark 1 mark</p>	2 marks
	c.ii		1 mark
	d	<p>Compound (C). 1 mark</p> <p>Because of the delocalization of the lone pair of electrons on oxygen over the arene ring. 1 mark</p>	2 marks

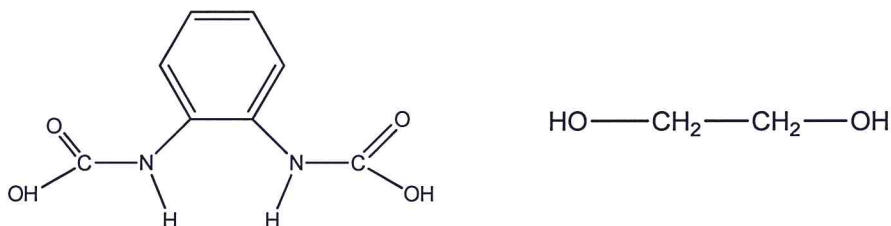


<u>Part</u>	<u>Section</u>	<u>The answer</u>	<u>The mark</u>
17	a.	benzoic acid	1 mark
	b.	(H ₂ O and CO ₂) or water and carbon dioxide Each correct product is worth 1\2 mark	1 mark
	c.	ester	1 mark
	d.	Compound (A)	1 mark
	e.	 (weakest) → (strongest) phenylmethanol < methylphenol < benzoic acid (weakest) → (strongest) -any compound in its correct order is worth 1 mark	3 mark
	f.	The effect :decrease (1 mark) Explanation : because atoms or groups like -Cl that draw electrons away from -CO ₂ ⁻ group will help the anion to form , and this causes the acid to dissociate more (that is, to become a stronger acid and less pKa) Or because electron-withdrawing groups increase the acid strength (decrease pKa) of carboxylic acids. (1 mark)	2 mark
	g.	Step (1) (1mark) Step (2) (1mark) -To get the mark all components of the equations should be correct for each step.	2 mark



Part	Section	The answer	The mark
18	a.i	Amine.	1 mark
	a.ii	Amide.	1 mark
	a.iii	Coupling reaction or electrophilic substitution reaction.	1 mark
	b.i	$\text{HNO}_2 + \text{HCl} + \text{NaNO}_2$ at $T < 5^\circ \text{C}$. To get the mark all reagent should be correct	1 mark
	b.ii	CH_3COCl	1 mark
	c.i		1 mark
	c.ii		1 mark
	d.i	Hydrogen bonds.	1 mark
	d.ii		2 marks
	e	Compound (A) is less basic than ammonia. 1 mark Because in compound (A), (phenylamine), the lone pair of electrons on nitrogen atom is delocalised over the benzene ring. 1 mark	2 marks



<u>Part</u>	<u>Section</u>	<u>The answer</u>	<u>The mark</u>
19	a.	Ester or -COO	1
	b.	C and D Each monomer is worth 1 mark	2
	c.	$\left(\text{N} \begin{array}{c} \text{H} \\ \end{array} (\text{CH}_2)_6 \begin{array}{c} \text{H} \\ \end{array} \text{N} \begin{array}{c} \text{O} \\ \end{array} \text{C} \begin{array}{c} \text{O} \\ \end{array} (\text{CH}_2)_4 \text{C} \right)_n$	1
	d.	Nylon 6,6	1
	e.	D 1 mark because it has a different functional group 1 mark	2
20	a	The amide bond that forms between two amino acids	1
	b	 <p>Each monomer is worth 1 mark</p>	2
	c	condensation	1

This is the end of the Marking Guide