

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1 B. Sc. Engineering Examinations 2015-2016

Sub : **CHEM 125** (Organic and Inorganic Chemistry)

Full Marks : 210

Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – AThere are **FOUR** questions in this Section. Answer any **THREE** questions.

1. (a) What is the Schrödinger wave equation? Deduce the equation and comment on its solution. (12)
- (b) Calculate the frequency (Hz) and wavelength (nm) of the emitted photon when an electron drops from the $n = 4$ to the $n = 2$ level in a hydrogen atom. (8)
- (c) What is meant by the term “Shielding of electrons” in an atom? Using the Li atom as an example, describe the effect of Shielding on the energy of electrons in an atom. (7)
- (d) Matter and radiation have a “dual nature” – Explain. (8)

2. (a) Write short note on effective nuclear charge. (6)
- (b) Which atom should have a smaller first ionization energy: Oxygen or sulfur? Which atom should have a higher second ionization energy: lithium or beryllium? Explain. (4+4=8)
- (c) Predict the products of the following oxides with water: Na_2O , BaO , N_2O_5 , P_4O_{10} , SO_3 . Write an equation for each of the reactions. Specify whether the oxides are acidic, basic, or amphoteric (5+5=10)
- (d) By means of balanced chemical equations and statement of conditions, describe a suitable synthesis of (i) xenon difluoride (ii) xenon hexafluoride (iii) xenon trioxide. (6)
- (e) The tetraaquazinc (II) ion, $[\text{Zn}(\text{H}_2\text{O})_4]^{2+}$ is colorless. Explain why this might be expected. (5)

3. (a) Describe molecular orbital theory? How does it differ from the valence bond theory? How does it differ from the valence bond theory? Using hybrid orbitals, describe the bonding in NH_3 according to valence bond theory. (6+4+5=15)
- (b) Determine the hybridization state of the central (underlined) atom in each of the following molecules: (i) $\underline{\text{Be}}\text{H}_2$, (ii) $\underline{\text{Al}}\text{I}_3$, (iii) $\underline{\text{P}}\text{F}_3$. Describe the hybridization process and determine the molecular geometry in each case. (9)
- (c) Considering the complex ion $[\text{CoF}_6]^{3-}$
 - (i) Mention the possible geometry? (6)
 - (ii) Which is a more likely color for this ion to absorb, red or blue?
 - (iii) Would you expect this complex to be high or low spin?

CHEM 125

Contd ... Q. No. 3

- (d) Use molecular orbital theory to explain why Be_2 molecule does not exist. (6)
4. (a) Define coordination number. What is the coordination number of Cs^+ in CsCl , Na^+ in NaCl and Zn^{2+} in ZnS ? (3+6=9)
- (b) Why is graphite an electrical conductor but diamond is not? (6)
- (c) Lithium metal has a body-centered cubic structure with all atoms at the lattice points and unit-cell length of 350.9 pm. Calculate Avogadro's number. The density of lithium is 0.534 g/cm^3 . (10)
- (d) Explain the differences between a primary galvanic cell (which is not rechargeable) – and a storage cell (which is rechargeable). (10)

SECTION – B

There are **FOUR** questions in this Section. Answer any **THREE** questions.

5. (a) Define conformation. Draw the potential energy curve of different possible conformation of Ethylene glycol ($\text{HOH}_2\text{C}-\text{CH}_2\text{OH}$). (8)
- (b) One compound whose molecular formula is C_4H_6 is a bicyclic compound. Another compound with the same formula has an infrared absorption at roughly at 2250-cm^{-1} and 3300 cm^{-1} . Draw structures for each of these two compounds and explain how the IR absorption allows them to be differentiated (Chart 1). (8)
- (c) Explain enantiomers, diastereomers and enantiomeric purity with suitable examples. (9)
- (d) A compound D with the molecular formula C_6H_{12} (alkene) is optically inactive but can be resolved into enantiomers. On catalytic hydrogenation, D is converted to E (C_6H_{14}) and E is optically inactive. Propose structures of D and E. (10)
6. (a) S_N^2 reaction proceeds with complete inversion of configuration whereas S_N^1 reaction proceeds with racemization. Explain with reaction mechanism. (14)
- (b) Explain the primary structure of DNA. (9)
- (c) Dehydration of 3, 3-Dimethyl-2-butanol by 85% H_3PO_4 gives 2, 3-Dimethyl-1-butene as a major product and 2, 3-Dimethyl-2-butene as a minor product. Explain the fact with reaction mechanism. (12)
7. (a) What is regioselective reaction? Oxymurcuration-demurcuration of 1-hexene yields 2-hexanol whereas, hydroboration-oxidation of 1-hexene yields 1-hexanol. How can you explain these facts? (2+10=12)

CHEM 125**Contd ... Q. No. 7**

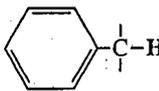
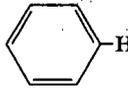
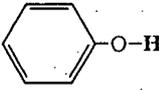
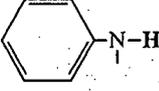
- (b) Why addition of bromine into a double bond gives anti product? (8)
- (c) Why alkenes follow electrophilic addition mechanism whereas benzene follows electrophilic substitution? (8)
- (d) Give the mechanism of Friedel-Craft's alkylation. (7)
8. (a) Calculate the stretching frequency of carbon-carbon double bonds. Given that, force constant of carbon-carbon double bond is 10×10^5 dynes/cm. (5)
- (b) Why conjugation lowers the frequency of Vibration? (5)
- (c) Why carboxylic acid-OH gives broad absorption in IR spectrum? (5)
- (d) Give the structure of five compounds which have equivalent protons and carbons. (5)
- (e) Explain Sanger N-Terminal Analysis for the determination of sequence of amino acid in protein. (7)
- (f) Propose the structure of $C_4H_8O_3$ from the following 1H -NMR and IR values. (8)
- (Chart 1 and 2)

δ (ppm)	Splitting	Integration	IR
1.27	t	3H	2500-3550 cm^{-1} (broad)
3.66	q	2H	1715 cm^{-1} (strong)
4.13	S	2H	
10.95	S	1H	

TABLE 2.3
A SIMPLIFIED CORRELATION CHART

Type of Vibration			Frequency (cm^{-1})	Intensity	Page Reference
C-H	Alkanes	(stretch)	3000-2850	s	31
	=CH ₂	(bend)	1450 and 1375	m	
	=CH-	(bend)	1465	m	
Alkenes		(stretch)	3100-3000	m	33
		(out-of-plane bend)	1000-650	s	
Aromatics		(stretch)	3150-3050	s	43
		(out-of-plane bend)	900-690	s	
Alkyne		(stretch)	ca. 3300	s	35
Aldehyde			2900-2800	w	56
			2800-2700	w	
C-C	Alkane		Not interpretatively useful		
C=C	Alkene		1680-1600	m-w	33
	Aromatic		1600 and 1475	m-w	43
C≡C	Alkyne		2250-2100	m-w	35
C=O	Aldehyde		1740-1720	s	56
	Ketone		1725-1705	s	58
	Carboxylic acid		1725-1700	s	62
	Ester		1750-1730	s	64
	Amide		1700-1640	s	70
	Anhydride		1810 and 1760	s	73
C-O	Acid chloride		1800	s	72
	Alcohols, ethers, esters, carboxylic acids, anhydrides		1300-1000	s	47, 50, 62, 64, and 73
O-H	Alcohols, phenols				
	Free		3650-3600	m	47
	H-bonded		3400-3200	m	47
	Carboxylic acids		3400-2400	m	62
N-H	Primary and secondary amines and amides				
	(stretch)		3500-3100	m	74
	(bend)		1640-1550	m-s	74
C-N	Amines		1350-1000	m-s	74
C=N	Imines and oximes		1690-1640	w-s	77
C≡N	Nitriles		2260-2240	m	77
X=C=Y	Allenes, ketenes, isocyanates, isothiocyanates		2270-1940	m-s	77
N=O	Nitro (R-NO ₂)		1550 and 1350	s	79
S-H	Mercaptans		2550	w	81
S=O	Sulfoxides		1050	s	81
	Sulfones, sulfonyl chlorides, sulfates, sulfonamides		1375-1300 and 1350-1140	s	82
C-X	Fluoride		1400-1000	s	85
	Chloride		785-540	s	85
	Bromide, iodide		< 667	s	85

TABLE 5.4
APPROXIMATE CHEMICAL SHIFT RANGES (PPM) FOR SELECTED TYPES OF PROTONS^a

$R-CH_3$		0.7-1.3	$R-\overset{ }{N}-\overset{ }{C}-H$	2.2-2.9
$R-CH_2-R$		1.2-1.4	$R-\overset{ }{S}-\overset{ }{C}-H$	2.0-3.0
R_3CH		1.4-1.7	$I-\overset{ }{C}-H$	2.0-4.0
$R-\overset{ }{C}=\overset{ }{C}-\overset{ }{C}-H$		1.6-2.6	$Br-\overset{ }{C}-H$	2.7-4.1
$R-\overset{O}{\parallel}{C}-\overset{ }{C}-H, H-\overset{O}{\parallel}{C}-\overset{ }{C}-H$		2.1-2.4	$Cl-\overset{ }{C}-H$	3.1-4.1
$RO-\overset{O}{\parallel}{C}-\overset{ }{C}-H, HO-\overset{O}{\parallel}{C}-\overset{ }{C}-H$		2.1-2.5	$R-\overset{O}{\parallel}{S}-\overset{O}{\parallel}{O}-\overset{ }{C}-H$	ca. 3.0
$N\equiv C-\overset{ }{C}-H$		2.1-3.0	$RO-\overset{ }{C}-H, HO-\overset{ }{C}-H$	3.2-3.8
		2.3-2.7	$R-\overset{O}{\parallel}{C}-O-\overset{ }{C}-H$	3.5-4.8
$R-C\equiv C-H$		1.7-2.7	$O_2N-\overset{ }{C}-H$	4.1-4.3
$R-S-H$	var	1.0-4.0 ^b	$F-\overset{ }{C}-H$	4.2-4.8
$R-N-H$	var	0.5-4.0 ^b	$R-\overset{ }{C}=\overset{ }{C}-H$	4.5-6.5
$R-O-H$	var	0.5-5.0 ^b		6.5-8.0
	var	4.0-7.0 ^b	$R-\overset{O}{\parallel}{C}-H$	9.0-10.0
	var	3.0-5.0 ^b	$R-\overset{O}{\parallel}{C}-OH$	11.0-12.0
$R-\overset{O}{\parallel}{C}-N-H$	var	5.0-9.0 ^b		

^aFor those hydrogens shown as $-\overset{|}{C}-H$, if that hydrogen is part of a methyl group (CH_3) the shift is generally at the low end of the range given, if the hydrogen is in a methylene group ($-CH_2-$) the shift is intermediate, and if the hydrogen is in a methine group ($-CH-$), the shift is typically at the high end of the range given.

^bThe chemical shift of these groups is variable, depending not only on the chemical environment in the molecule, but also on concentration, temperature, and solvent.

The figures in the margin indicate full marks.

Symbols have their usual meaning.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this Section. Answer any **THREE**.

1. (a) Consider $f(x) = \begin{cases} 1+x, & x \leq 0 \\ x, & 0 < x < 1 \\ 2-x, & 1 \leq x \leq 2 \\ 2x-x^2, & x > 2 \end{cases}$.

Does $f'(x)$ exist at $x = 1$ and $x = 2$? Is it necessary to check the continuity at $x = 1$, $x = 2$? Explain. Also sketch the graph and check the continuity from the graph at $x = 1$, $x = 2$. (15)

(b) If $y = e^{\tan^{-1}x}$, then show that $(1+x^2)y_{n+2} + (2nx+2x-1)xy_{n+1} + n(n+1)y_n = 0$. Also find $(y_n)_0$. (10)

(c) If $y = \frac{1}{(x-1)^3(x-2)}$, find y_n . (10)

2. (a) Evaluate : (i) $\lim_{x \rightarrow 0} \left(\frac{1}{x^2} - \frac{1}{\sin^2 x} \right)$. (ii) $\lim_{x \rightarrow 1} \frac{\ln(\cos \frac{\pi x}{2})}{\ln(1-x)}$ (20)

(b) Expand $f(x) = \frac{1}{x+1}$ in powers of $(x-3)$. Also find Lagrange and Cauchy's form of remainder. (15)

3. (a) Verify Rolle's theorem for $f(x) = e^{-x} \sin x$ in the interval $(0, \pi)$. (15)

(b) Find the radius of curvature at (r, θ) on the curve $r^n = a^n \cos n\theta$. (10)

(c) If $u = \tan^{-1} \left\{ \frac{(x^2 + y^2)}{(x-y)} \right\}$, prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \sin 2u$ and also evaluate $x^2 u_{xx} + 2xy u_{xy} + y^2 u_{yy}$. (10)

4. (a) Sketch a graph of the equation $y = x^3 - 3x + 2$ and identify the exact location of relative extrema, inflection points and also find the interval of increasing and decreasing. (15)

(b) Prove that the curve $\left(\frac{x}{a}\right)^n + \left(\frac{y}{b}\right)^n = 2$ touches the straight line $\frac{x}{a} + \frac{y}{b} = 2$ at the point (a, b) , whatever the value of n . (10)

(c) Find all the asymptotes of $x^3 + 2x^2y - xy^2 - 2y^3 + 4y^2 + 2xy + y - 1 = 0$. (10)

MATH 113**SECTION – B**

There are **FOUR** questions in this Section. Answer any **THREE**.

5. (a) Find reduction formula for $I_{m,n} = \int \cos^m x \cos nx dx$ and then using this reduction formula evaluate $\int \cos^4 x \cos 3x dx$. (12)

(b) Evaluate $\lim_{n \rightarrow \infty} \left[\frac{n}{n^2 + 1^2} + \frac{n}{n^2 + 2^2} + \frac{n}{n^2 + 3^2} + \dots + \frac{n}{n^2 + n^2} \right]$. (12)

(c) Evaluate $\int_0^{\pi} \frac{x \sin x}{1 + \cos^2 x} dx$ (11)

6. (a) Prove that $\int_0^{\infty} \log \left(x + \frac{1}{x} \right) \frac{dx}{1+x^2} = \pi \log 2$ (12)

(b) Evaluate $\int_0^{\infty} \frac{\sqrt{x}}{(1+x)^2} dx$. (11)

(c) Evaluate the following integrals: (i) $\int e^x (\cos x + \sin x) dx$

(ii) $\int \frac{1}{1 + \sin x + \cos x} dx$. (12)

7. (a) Show that $\int_0^{\pi/2} \sin^p x \cos^q x dx = \frac{\Gamma\left(\frac{p+1}{2}\right) \Gamma\left(\frac{q+1}{2}\right)}{2\Gamma\left(\frac{p+q+2}{2}\right)}$. (12)

(b) Evaluate $\int_0^{\infty} \frac{x^{2m}}{1+x^{2n}} dx$. (12)

(c) Find the area of the region bounded by the curve $\left(\frac{x}{a}\right)^{2/3} + \left(\frac{y}{a}\right)^{2/3} = 1$. (11)

8. (a) Find the volume and surface area generated by revolution of the area enclosed by $y = 4 - x^2$, $y = 0$ about x axis. (12)

(b) Find the area bounded by cardioide $r = a(1 + \cos \theta)$. (11)

(c) Prove that $\frac{\beta(p, q+1)}{q} = \frac{\beta(p+1, q)}{p} = \frac{\beta(p, q)}{p+q}$. (12)

SECTION – A

There are **FOUR** questions in this Section. Answer any **THREE** questions.

1. (a) Define simple harmonic motion. Write down its differential equation and solve it. (3+12)
 (b) Deduce an expression for the total energy of an oscillator and show that at the position of $\frac{a}{\sqrt{2}}$, potential energy is half of the total energy where a is the amplitude. (12)
 (c) The scale of a spring balance reading from 0 to 30 kg is 49 cm. A package suspended from the balance is found to oscillate vertically with a frequency of $\frac{5}{\pi}$ hertz. How much does the package weigh? (8)

2. (a) What do you mean by Lissajous figures? Deduce an expression for Lissajous figures of two oscillations having the same angular frequency but different amplitudes and phase differences. Under what condition the figure becomes a circle. (4+15)
 (b) What is forced oscillation? Derive the differential equation of it and solve it for steady state. Find the resonance condition. (16)

3. (a) Write down the characteristics of a mechanical wave. Derive the relation $\frac{\partial^2 \Psi}{\partial t^2} = v^2 \frac{\partial^2 \Psi}{\partial x^2}$ where the symbols have their usual meaning. (4+8)
 (b) State the principle of superposition. Discuss analytically the formation of stationary waves due to reflection at a rigid boundary and hence show that at the position of antinode strain is minimum. (2+9)
 (c) The equation of a travelling wave given by $\Psi = 2\sin 0.1\pi(10^3t - x)$ in C. G. S unit is reflected back from a rigid support and produces five loops. Determine (i) the resultant equation of the waves, (ii) Wave speed and the distance between incident and reflected points, (iii) Positions of the antinodes. (12)

4. (a) What are degrees of freedom and equipartition of energy? (7)
 (b) Define Vander Waals equation of state. Show that $\left(P + \frac{a}{V^2}\right)(V - b) = RT$ where the symbols have their usual meanings. (18)
 (c) Calculate the Vander Waals constants for dry air, given that critical temperature $T_c = 132$ k, critical pressure $P_c = 37.2$ atmospheres, R per mole = $82.07 \text{ cm}^3 \text{atmsK}^{-1}$. (10)

PHY 123

SECTION – B

There are **FOUR** questions in this Section. Answer any **THREE** questions.

5. (a) What do you understand by the term entropy? Calculate and explain the change in entropy for both the reversible and irreversible processes. (12)
- (b) Show that the entropy increases in an irreversible process. Explain the change in entropy during conduction of heat through a metallic bar. (13)
- (c) Calculate the increase in entropy when 1 gm of ice at -20°C is converted to steam at 100°C . Given specific heat of ice = $0.5 \text{ cal gm}^{-1} \text{ K}^{-1}$, latent heat of ice = 80 cal gm^{-1} and latent heat of steam = 540 cal gm^{-1} . (10)
6. (a) Briefly explain four thermodynamic functions. Deduce Maxwell's thermodynamic relations. (18)
- (b) Describe the effect of pressure during melting and boiling of any substance on the basis of the Clausius-Clapeyron equation. (8)
- (c) Calculate the melting point of ice when the pressure is increased by 2 atm. How much pressure is required to lower the melting point by 1°C ? The latent heat of fusion of ice is 80 cal gm^{-1} and specific volume of ice is $1.091 \text{ cm}^3 \text{ gm}^{-1}$. (9)
7. (a) What do you understand by (i) temporal coherence and (ii) spatial coherence? (6)
- (b) Describe Stoke's theorem to explain the change of phase when reflection takes place at a denser medium. (6)
- (c) Discuss the theory of formation Newton's rings and explain how the wavelength of monochromatic light can be determined. Why the central fringe is dark? (17)
- (d) A parallel beam of light of wave length $\lambda = 5890 \text{ \AA}$ is incident on a glass plate ($\mu = 1.5$) such that the angle of refraction into the plate is 60° . What should be the minimum thickness of the glass plate which would make the plate dark in reflected light? (6)
8. (a) Define the terms: (12)
- (i) Circularly polarized light, (ii) Brewster's angle,
(iii) O-ray and E-ray, and (iv) Optic axis of a crystal.
- (b) What is a Nicol prism? Describe the construction and working principle of a Nicol prism and how this can be used as polarizer and an analyzer. (17)
- (c) Calculate the thickness of half wave plate for light of wavelength 5893 \AA , given $\mu_0 = 1.54$ and ratio of velocity of ordinary and extraordinary rays is 1.007. (6)
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SECTION – A

There are **FOUR** questions in this Section. Answer Q. No. 1 and any **TWO** from the rest.

1. (a) Explain with reference to the context any two of the following: (15)
- (i) That's why it's better to be born lucky than rich.
- (ii) We want to be rescued; and of course we shall be rescued.
- (iii) He had a working analysis of mankind's troubles: marriage, money, and the tangles of human ties.
- (b) Answer any one of the following: (15)
- (i) Write a note on imperialism in the light of the story "Shooting an Elephant".
- (ii) Depict the story "Fire on the Mountain" as an allegory.
- (c) Answer any three of the following: (15)
- (i) Mention at least two figurative devices used in the story "An Astrologer's Day?"
- (ii) Is the title of the story "Fire on the Mountain" justified?
- (iii) What is your reaction as a reader to the shooting of the elephant?
- (v) How does the materialistic greed of the family affect the psychology of the young boy Paul?
- (v) Portray the character of the Astrologer.
2. (a) Recast and correct any ten of the following sentences: (15)
- (i) We heard a sound somewhere in the distant locality.
- (ii) Mrs. Kohinur's illusion was a belief that she was very seriously ill.
- (iii) The stale bread was awful hard.
- (iv) The teacher chose Maria and myself for the task.
- (v) It looks like it's going to rain.
- (vi) This task is the most essential function in the operation.
- (vii) Mr. Halim spoke to his son about his course selections for next year.
- (viii) Mamun was reading "The mayor of Casterbridge."
- (ix) Mr. Himel conducted a searching self analysis.
- (x) Adhisha referred back to the matter of yesterday.
- (xi) Angshu likes to swim, playing tennis, and riding.
- (xii) Mr. Adib spoke for a half of an hour.

HUM 187

Contd ... Q. No. 2

(b) Give the meaning of and make sentences with any ten of the following words: (15)
Flee, glossary, hypothesis, infested, litter, outrageous, posterity, repel, sever, surfeit, transcend, trend.

3. Amplify the idea in any one of the following: (30)
(a) To anyone who wishes to amend his life, there is no time like the present.
(b) Behaviour reflects one's personality.

4. (a) Write a précis of the following passage with a suitable title: (30)

Trees give shade for the benefit of others and while they themselves stand in the sun and endure scorching heat, they produce the fruit by which others profit. The character of good men is like that of trees. What is the use of this perishable body, if no use of it is made for the benefit of mankind? Sandalwood – The more it is rubbed, the more scent does it yield.

Sugarcane – the more it is peeled and cut into pieces, the more juice does it produce. Gold – the more it is burnt, the more brightly does it shine. The men who are noble at heart do not lose these qualities even in losing their lives. What does it matter whether men praise them or not? What does it make whether riches abide with them or not? What does it signify whether they die at this moment or whether their lives are prolonged? Happen what may, those who triad in the right path will not set foot in any other. Life itself is unprofitable to a man who does not live for others. To live for the mere sake of living one's life is to live the life of dogs and cows. Those who lay docon their lives for the sake of a friend, or even for the sake of a stranger, will assuredly dwell forever in a world of bliss.

SECTION – B

There are **FOUR** questions in this Section. Answer any **THREE** Questions including Q. No. 5 as compulsory.

5. Read the passage carefully and answer the questions that follow: (45)

You seemed at first to take no notice of your school-fellows, or rather to set yourself against them because they were strangers to you. They know as little of you as you did of them; so that this would have been the reasons for their keeping aloof from you as well, which you would have fell as a hardship. Learn never to conceive a prejudice against other become you know nothing of them. It is bad reasoning, and makes enemies of half the world.

HUM 187

Contd ... Q. No. 5

Do not think ill of them till they behave ill to you; and them strive to avoid the faults which you see in them. This will disarm their hostility sooner than pique or resentment or complaint. I thought you were disposed to criticize the dress of some of the boys as not so good as your own. Never despise any one for anything that he cannot help – least of all, for his poverty. I would wish you to keep up appearances yourself as a defense against the idle sneers of the world, but I would not wish you value yourself upon them. I hope you will never be the dape nor victim of vulgar prejudices. Instead of saying above “Never despise anyone for anything that he cannot help, “I might have said, “Never despise anyone at all”. For contempt implies a triumph over and pleasure in the ill of another. It means that you are glad and congratulate yourself on their failings or misfortunes.

You might have hitherto been a spoilt child, and have been used to have your own way a good deal, both in the house and among your playfellows, with whom you were too fond of being a leader; but you have good nature and good sense, and will get the better of this in time. You have now got among other boys who are your equals, or bigger and stronger than yourself and who have something else to attend to besides humouring your whims and fancies, and you feel this as a repulse or piece of injustice. But the first lesson to learn is that there are other people in the world besides yourself. The more airs of childish self-importance you give yourself, you will only expose yourself to be the more thwarted and laughed at. True equality is the only true morality or wisdom. Remember always that you are but one among others and you can hardly mistake your place in society. In your own house you might do as you pleased; in the world you will find competitions at every turn. You are not born to destroy or dictate to millions; you can only expect to share their fate, or settle your difference amicably with them.

Questions:

- (i) What reasons does the author give for not harbouring a prejudice against others?
 - (ii) What are some of the blessings of living with others in the same class or the same place?
 - (iii) Comment on the statement, “Contempt implies a triumph over and pleasure in the ill of another.”
 - (iv) The author says “in the world you will find competitions at every turn.” But competitions is a very good things. What does he seem to warn us about it?
 - (v) What have you learnt from the passage? Express you opinion on it.
6. (a) Discuss in brief the principles of writing a business letter. (10)
- (b) Draft a suitable reply to a claim made by one of your business clients seeking appropriate steps to be taken in his favour regarding the problems that were identified with the electrical products supplied by you. (10)
- (c) Write the phonetic transcriptions of the following words: (Any five): (10)
- Enrich, cottage, son, care, load, abstract.

HUM 187

7. (a) How many parts are there in a formal report? Write in brief any five of them. (10)
- (b) Write a short essay on any ONE of the following topics: (10)
- (i) Online shopping
 - (ii) Loneliness and Modern Man
 - (iii) Challenges of Living in Dhaka City.
- (c) Write a dialogue between two students of your department about the prospect of Bio-Medical Engineering in Bangladesh. (10)
8. (a) Transform the following sentences as directed. (Any five) (10)
- (i) Being a cripple, he cannot ride a horse. (Complex)
 - (ii) He was terribly unhappy but he didn't blame the girl. (Simple)
 - (iii) A relationship needs to be tended like a plant. (Compound)
 - (iv) Speak the truth and I shall pardon you. (Simple)
 - (v) Success or failure depends largely on your own efforts. (Complex)
 - (vi) The evil that men do live after them. (Compound).
- (b) What are the characteristic features of a sales letter? (5)
- (c) Write short notes on any THREE of the following: (15)
- (i) Branches of linguistics
 - (ii) The diphthongs
 - (iii) Qualities of a good paragraph
 - (iv) Tips for successful dialogue writing.
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