BIOLOGY HSSC–I

SECTION – A (Marks 17)

Punjab Text Book Board

Time allowed: 25 Minutes | **Version Number** | 1 | 8 | 6 | 8 |

Note: Section – A is compulsory. All parts of this section are to be answered on the separately provided OMR Answer Sheet which should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

Q. 1 Choose the correct answer A / B / C / D by filling the relevant bubble for each question on the OMR Answer Sheet according to the instructions given there. Each part carries one mark.

1) At high altitude RBCs of human blood will:

A. Decrease in size B. Decrease in number
C. Increase in number D. Increase in size

2) Guttation in plants is more notable when:

A. Transpiration is low B. Imbibition starts
C. Temperature is high D. Relative humidity is low

3) Which of the following bonds is found in the molecular structure of Carbohydrates?

A. $C-H$ B. $C-S$ C. $C-O$ D. $C-N$

4) Pepsin (enzyme) works at the pH of:

A. 2.0 B. 6.5 C. 4.5 D. 5.5

5) Tay Sach's disease is caused because of the absence of an enzyme that is involved in the catabolism of:

A. Proteins B. Lipids
C. Polysaccharides D. Monosaccharides

6) Which one is **NOT** a viral disease?

A. Small pox B. Poliomyelitis C. Influenza D. Anthrax

7) The tail of bacteriophage releases lysozyme to dissolve a portion of bacterial:

A. Slime B. Capsule C. Cell wall D. Cell membrane

8) Cyst formation is a characteristic of some species of bacteria. It is resistance to:

A. Desication B. pH
C. High temperature D. Chemical agent

9) Which of the following organisms help in formation of lime stone deposits?

A. Radiolarians B. Diatoms C. Zooflagellates D. Formas

10) Which one of following is **NOT** included in Chlorophyta?

A. Spirogyra B. Polysiphonia C. Ulva D. Acetabularia

11) Which fungus is used for fermenting/producing soya sauce and soya paste from soya bean?

A. Penicillium B. Agaricus C. Neurospora D. Aspergillus

12) The simplest of all bryophytes are:

A. Liverworts B. Whisk ferns C. Mosses D. Hornworts

13) The common name of Oryza sativa is:

A. Wheat B. Oats C. Rice D. Maize

14) The zoological name of earthworm is:

A. Pheretima posthuma B. Enterobius vermicularis
C. Hirudo medicinalis D. Ascaris lumbricoides

15) Animals with jointed legs belong to which phylum?

A. Annelida B. Echinodermata C. Mollusca D. Arthropoda

16) Which one is **NOT** a phase of Calvin cycle?

A. Regeneration of CO_2 acceptor B. Phosphorylation
C. Carbon fixation D. Reduction

17) Gallstones are produced by the precipitation of:

A. Glucose B. Vitamins C. Proteins D. Cholesterol

BIOLOGY HSSC–I

Punjab Text Book Board

Time allowed: 2:35 Hours **Total Marks Sections B, C and D: 68**

NOTE: The Questions of sections B, C and D are to be answered on the separately provided answer book. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly.

SECTION – B (Marks 21)

(Chapters 1 – 8)

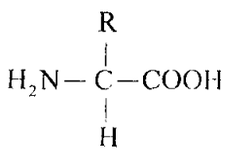
Q. 2 Answer any SEVEN parts from the following. All parts carry equal marks. **(7 x 3 = 21)**

(i) Define following terms: **(1+1+1)**

a. Hydroponic Culture technique **b.** Integrated Disease Management

c. Endangered Species

(ii) The formula below shows the structure of an amino acid:



a. What groups do H_2N and $COOH$ represent in the formula? **(1+1)**

b. Name the bond formed between two such amino acids. **(1)**

(iii) **a.** Name the non-protein part of an enzyme. **(1)**

b. Define inhibitors and name their types only. **(1+1)**

(iv) Compare the structure and functions of Peroxisome and Glyoxysomes. **(1.5+1.5)**

(v) **a.** What is hepatitis? Give its symptoms. **(1+1)**

b. What are causes of hepatitis B? **(1)**

(vi) **a.** List two characteristics each of Gram-positive and Gram-negative bacteria. **(2)**

b. Differentiate between hormogonia and Akinetes. **(1)**

(vii) **a.** What is the importance of marine algae? **(1)**

b. Name one animal of Zooflagellates and Apicomplexans. **(1+1)**

(viii) **a.** What are water molds? **(1)**

b. What infamous role water molds have played in the human history? **(2)**

(ix) **a.** Write down one difference between Rust and Smut. **(1)**

b. Define the following: **(1+1)**

i. Ascocarp **ii.** Parasexuality

(x) What economic losses occur because of fungi (especially owing to plants diseases and decomposition). **(2+1)**

SECTION – C (Marks 21)

(Chapters 9 – 14)

Q. 3 Answer any SEVEN parts from the following. All parts carry equal marks. **(7 x 3 = 21)**

(i) How have the bryophytes adapted terrestrial mode of life? **(3)**

(ii) Which class of plants do the Equisetum and Adiantum belong to? Also write the characteristics of these classes. **(1.5+1.5)**

(iii) Write down botanical names of the following angiospermic plants. **(1+1+1)**

a. Wheat **b.** Potato **c.** Amaltas

(iv) What are parasites? How have parasitic Platyhelminthes adapted themselves to parasitic mode of life? **(1+2)**

(v) Why have the Echinoderms been placed closest to phylum Chordates? Give three reasons. **(3)**

(vi) Write down the name and characteristics of the earliest bird fossil. **(1+2)**

(vii) What are the raw material and products of light reactions of photosynthesis? Where do light reactions take place? **(2+1)**

(viii) Show by reactions: **(1.5+1.5)**

a. Alcoholic fermentation **b.** Lactic Acid fermentation

(ix) **a.** What is pyrosis? List its causes. **(1+1)**

b. Name the pathogen that causes the disease tuberculosis. **(1)**

(x) Name the respiratory pigments in humans. How do they help in the transport of oxygen within the body? **(1+2)**

SECTION – D (Marks 26)

Note: Attempt any TWO questions. All questions carry equal marks. (2 x 13 = 26)

Q. 4 **a.** What are plastids? Describe their various types. Also draw diagram. **(1+4+2)**

b. Describe the life cycle of Rhizopus. Also draw diagram. **(4+2)**

Q. 5 **a.** Explain different steps in evolution of Megaphyll leaf. Also draw diagram. **(3+1)**

b. What is Glycolysis? Describe various reactions in Glycolysis. Also draw diagram. **(1+5+3)**

Q. 6 **a.** Write in detail the two hypotheses which explain the opening and closing of Stomata. **(06)**

b. What is Cardiac cycle? Write down its various stages in humans. Also draw diagram. **(1+4+2)**

BIOLOGY HSSC–I

SECTION – A (Marks 17)

National Book Foundation

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Time allowed: 25 Minutes

Version Number	1	8	5	9

Note: **Section – A is compulsory. All parts of this section are to be answered on the separately provided OMR Answer Sheet which should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.**

Q. 1 **Choose the correct answer A / B / C / D by filling the relevant bubble for each question on the OMR Answer Sheet according to the instructions given there. Each part carries one mark.**

1) _____ is called the Pacemaker of the heart.

A. A.V Node B. Bundle of His C. Purkinje Fibres D. S.A Node

2) The Hepatic Portal vein is formed by the union of splenic vein and _____ vein.

A. Cystic B. Superior Mesenteric
C. Inferior Mesenteric D. Hepatic

3) Natural killer cells release proteins called _____ to kill their target.

A. Interferon B. Interleukin C. Perforin D. Histamine

4) The basic protein subunit of Intermediate filament is:

A. Actin B. Vimentin C. Tubulin D. Tropomyosin

5) A plant cell stores Lipids in:

A. Elaioplast B. Proteinoplast C. Etioplast D. Amyloplast

6) Which one of the following is **NOT** a heteropolysaccharide?

A. Chitin B. Peptidoglycan C. Agar D. Pectin

7) Prostaglandins are derived from:

A. Phosphatidic acid B. Arachidonic acid
C. Linolenic acid D. Cholesterol

8) Cyanides are potent poisons of living organisms as they act as _____ inhibitors.

A. Reversible Non-competitive B. Non-competitive
C. Irreversible Non-competitive D. Competitive

9) Reovirus which causes diarrhoea is a _____ virus.

A. ds RNA B. ss DNA C. ss RNA D. ds DNA

10) Pleuritic pain, sudden chill and rusty red brown sputum are the main symptoms of:

A. Tuberculosis B. Typhoid C. Herpes D. Pneumonia

11) The condition in bacterium in which it possesses a single flagellum at both ends is called:

A. Amphibitrichous B. Amphilophotrichous
C. Amphitrichous D. Monopolar Bitrichous

12) For the first time, the level of Monera was raised to Kingdom level by:

A. John Hog B. Ehrenberg
C. Ernst Haeckel D. Herbert Copland

13) All of the following are green algae **EXCEPT**:

A. *Ulva* B. *Laminaria* C. *Spirogyra* D. *Chlorella*

14) Horsetails is the common name of group:

A. Lycopsida B. Pteropsida C. Sphenopsida D. Psilopsida

15) Cartilaginous fishes possess all of the following characters **EXCEPT**:

A. Four pairs of gills B. J. Shaped stomach
C. Heterocercal tail D. Placoid scales

16) During development, Trochophore larva is formed in phylum:

A. Mollusca B. Arthropoda C. Echinodermata D. Cnidaria

17) Phellogen is also called:

A. Vascular Cambium B. Cork Cambium
C. Intercalary Meristem D. Lateral Meristem

BIOLOGY HSSC–I

National Book Foundation

Time allowed: 2:35 Hours **Total Marks Sections B, C and D: 68**

NOTE: The Questions of sections B, C and D are to be answered on the separately provided answer book. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly.

SECTION – B (Marks 21)

(Chapters 1 – 7)

Q. 2 Answer any SEVEN parts from the following. All parts carry equal marks. **(7 x 3 = 21)**

(i) Name the types of Centrifugation. Also write their mechanism.

(ii) Give functions of any three Plasma Membrane Proteins.

(iii) Define Heat Capacity of water. How does it help organisms to live in different conditions?

(iv) Explain briefly the structure and function of mRNA.

(v) Outline the mechanism of Photorespiration in plants.

(vi) What are different uses of Bacteriophage in Genetic Engineering?

(vii) Write the structure of basic parts of a Flagellum in bacterium.

(viii) Define and explain briefly Transformation and Transduction.

(ix) Draw and label life cycle of *Physarum.*

(x) Write about the structure of Envelope and Capsid of Human Immunodeficiency Virus.

SECTION – C (Marks 21)

(Chapters 8 – 13)

Q. 3 Answer any SEVEN parts from the following. All parts carry equal marks. **(7 x 3 = 21)**

(i) Name and define the Pathways taken by water to reach xylem vessels in plants.

(ii) Write about the General characteristics of Phylum Aschelminthes.

(iii) Briefly explain Starch Sugar Theory for opening of stomata.

(iv) How do Auxins affect stem, roots and floral buds in plants?

(v) Write about Aetiology, Prevention and Treatment of Dyspepsia?

(vi) Differentiate between Artificial Active Immunity and Artificial Passive Immunity.

(vii) Outline the structure of a typical Antibody.

(viii) Write a note on the structure of different layers of an Artery.

(ix) How do Interferons act as protective proteins?

(x) a. What is the mechanism of Angioplasty?

b. Name the largest Lymphatic Duct in human body.

SECTION – D (Marks 26)

Note: Attempt any TWO questions. All questions carry equal marks. **(2 x 13 = 26)**

Q. 4 a. Explain the development of Male and Female gametophytes and Double Fertilization in Flowering Plants. Also draw the diagram of Life cycle of a Flowering Plant. **07+02**

b. Give an account of General Characteristics and Evolutionary Adaptations of Class Amphibia. **04**

Q. 5 a. Describe the main steps of Calvin cycle. Also draw a labelled Calvin cycle. **06+02**

b. How is Fungi used in Baking, Genetic Engineering and Antibiotics production. **05**

Q. 6 a. Give a detailed account of structure of Small Intestine in Humans. **08**

b. Describe the Groups of Enzymes on the basis of types of reactions. **05**

BIOLOGY HSSC–I

SECTION – A (Marks 17)

National Book Foundation

Time allowed: 25 Minutes

Version Number	1	8	6	1

Note: **Section – A is compulsory. All parts of this section are to be answered on the separately provided OMR Answer Sheet which should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.**

Q. 1 **Choose the correct answer A / B / C / D by filling the relevant bubble for each question on the OMR Answer Sheet according to the instructions given there. Each part carries one mark.**

1) During Interphase, nucleoli are formed by:
   A. Primary Constriction B. Secondary Constriction
   C. Satellite DNA D. Heterochromatin

2) All of the following proteins are part of Microfilament **EXCEPT**:
   A. Actin B. Tropomyosin **C.** Tubulin D. Troponin

3) The structural protein which provides support to the connective tissue is:
   A. Collagen B. Histone C. Keratin D. Elastin

4) The length of each turn of DNA is:
   A. 2 nm B. 10 nm C. 3.4 nm D. 34 nm

5) Histidine decarboxylase is an example of _____ type of enzymes.
   A. Lyases B. Transferases **C.** Oxidoreductase D. Hydrolase

6) The genome of Retrovirus consists of:
   A. ss RNA B. ds RNA C. ss DNA D. ds DNA

7) The transfer of genetic material from one bacterium to another through third party is called:
   A. Conjugation B. Translation **C.** Transduction D. Transformation

8) The correct sequence of Ribosomal RNA of Archaea is:
   A. AACUCAAA B. AAACUUAAA **C.** AACUUCAA D. AAACUUAAC

9) *Trypanosoma* is a/an:
   A. Ciliate B. Apicomplexan **C.** Actinopod D. Zooflagellate

10) Which one of the following is **NOT** true about Bryophyta?
   A. Lack Vascular Tissues **B.** Have Independent Sporophyte
   C. Have Independent Gametophyte **D.** Have Multicellular Sex Organ

11) _____ belongs to group Pteropsida.
   A. *Psilotum* B. *Lycopodium* **C.** *Equisetum* D. *Adiantum*

12) Hepatic vein receives blood from Gall Bladder via _____ vein.
   A. Cystic B. Central
   C. Inferior Mesenteric D. Gastric

13) The enzyme produced by liver for blood clotting is:
   A. Histamine B. Biliverdin **C.** Histidine D. Heparin

14) Macrophages are derived from:
   A. Monocytes B. Lymphocytes **C.** Neutrophils D. B. Cells

15) Endogenous Pyrogens produced in response to infection cause decrease in:
   A. Body temperature **B.** Iron concentration
   C. Interferon production **D.** Macrophage production

16) The locomotory organ of *Nereis* is:
   A. Tube Feet B. Setae **C.** Parapodia D. Fins

17) The enzyme which consists of RNA and is found in ribosome is called:
   A. Polysome B. Mesosome **C.** Ribozyme D. Centrosome

BIOLOGY HSSC–I

National Book Foundation

Time allowed: 2:35 Hours **Total Marks Sections B, C and D: 68**

NOTE: The Questions of sections B, C and D are to be answered on the separately provided answer book. Use supplementary answer sheet i.e. Sheet–B If required. Write your answers neatly and legibly.

SECTION – B (Marks 21)

(Chapters 1 – 7)

Q. 2 Answer any SEVEN parts from the following. All parts carry equal marks. **(7 x 3 = 21)**

(i) Which organelle is called 'Suicidal bag' and why?
(ii) Write about phases of Paper Chromatography.
(iii) Name and define different types of Stereoisomers in monosaccharides.
(iv) Write down the functions of Prostaglandins in Humans.
(v) How does Bacteriophage cause infection to their host?
(vi) What is CLCuD? Write about its Transmission, Symptoms and Treatment.
(vii) Define and explain briefly Photoautotrophic mode of Nutrition in bacteria. Also give an example.
(viii) Draw and label life cycle of a Mushroom.
(ix) Fungi are neither placed in Kingdom Animalia nor in Kingdom Plantae. Comment.
(x) Differentiate between: (one difference each)
  a. Action and Absorption spectrum
  b. Photophosphorylation and Photorespiration
  c. Prion and Viroid

SECTION – C (Marks 21)

(Chapters 8 – 13)

Q. 3 Answer any SEVEN parts from the following. All parts carry equal marks. **(7 x 3 = 21)**

(i) Name and explain briefly the hypotheses for the Evolution of Single Veined Leaves.
(ii) Differentiate between the two groups of Coelomates.
(iii) How did evolution of Integument around Megasporangium and Heterospory help in evolution of seed?
(iv) a. Define Vernalization and Photoperiodism
  b. Write any two adaptations in Xerophytic plants for osmotic adjustment.
(v) Write down the Names, Location and Functions of divisions of Pharynx in Humans.
(vi) Write any two major Functions of Large Intestine in Humans.
(vii) What are the causes of Ulcer? How can it be treated?
(viii) Enlist any three types of Helper T-Cells with their functions.
(ix) Skin is acting as First Line of Defence. Justify the statement.
(x) Differentiate between Class Osteichthyes and Chondrichthyes (Any three differences)

SECTION – D (Marks 26)

Note: Attempt any TWO questions. All questions carry equal marks. **(2 x 13 = 26)**

Q. 4 **a.** Explain the structure of Chambers and Valves present in Human Heart. Also draw a neat and labelled diagram of Human Heart. **07+02**

b. Give an account of General Characteristics of Class Mammalia. **04**

Q. 5 **a.** Describe the Components and Mechanism of TACT theory. Also draw the diagram. **06+02**

b. Write a note on Non-competitive Inhibitors. **05**

Q. 6 **a.** Discuss the steps involved in Kreb's cycle. Also draw well labelled cycle. **07+02**

b. Outline the Phases of Bacterial Growth. **04**

CHEMISTRY HSSC–I

SECTION – A (Marks 17)

Time allowed: 25 Minutes

Version Number	1	8	4	6

Note: **Section – A is compulsory. All parts of this section are to be answered on the separately provided OMR Answer Sheet which should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.**

Q. 1 **Choose the correct answer A / B / C / D by filling the relevant bubble for each question on the OMR Answer Sheet according to the instructions given there. Each part carries one mark.**

1) If the amount of a product obtained in a chemical reaction is $250\,g$ while its theoretical yield is $500\,g$. Its percentage yield will be:
A. 25% B. 35% C. 45% D. 50%

2) According to Bohr's atomic theory, the angular momentum (mvr) of an electron is equal to:
A. $\frac{nh}{2\pi}$ B. $\frac{nh}{\pi}$ C. $\frac{3nh}{2\pi}$ D. $\frac{2nh}{\pi}$

3) In H_2O molecule, there are two bond pairs and two lone pairs around the central atom. Its molecular shape will be:
A. Tetrahedral B. Trigonal planer C. V-shaped D. Trigonal pyramidal

4) Which one of the following is different from others?
A. 1atm B. 14.7Psi C. 760 torr D. $273\,^{\circ}C$

5) Surface tension of a liquid is directly related to the strength of inter molecular force of attraction. Indicate the one with lowest surface tension among the following:
A. Benzene B. Water C. Methanol D. Ethanol

6) Carbon exists in both, diamond (cubic form) and graphite (hexagonal form). This phenomenon is known as:
A. Isomorphism B. Polymorphism C. Allotropy D. Anisotropy

7) Consider the following reaction. $NO_{(g)} + O_{3(g)} \longrightarrow NO_{2(g)} + O_{2(g)}$ Rate $= K[NO][O_3]$. Which statement is NOT correct about the given reaction?
A. The reaction is of first order with respect to NO
B. The reaction is of first order with respect to O_3
C. If $[O_3]$ is constant and $[NO]$ is increased twice, the rate of reaction will be increased thrice
D. If $[NO]$ is constant and $[O_3]$ is increased twice rate, the of reaction will be increased twice

8) If pK_a values of different acids are given below, indicate the strongest acid among them:
A. −10.0 B. −9.0 C. −7.0 D. −3.0

9) The rate of a chemical reaction is measured in:
A. $mol.dm^{-3}.S^{-1}$ B. $mol.dm^{3}.S^{-1}$ C. $mol.dm^{3}.S$ D. $dm^{3}.mol^{-1}.S^{-1}$

10) $100g$ of 10% (W/W) $NaOH$ solution contains $10g$ of $NaOH$ in:
A. $10g$ of H_2O B. $90g$ of H_2O C. $100g$ of H_2O D. $110g$ of H_2O

11) "The net heat change in a chemical reaction is same whether, it is brought about in one step or more than one step". It is known as:
A. Henry's law B. Joule Thomson's Effect
C. Hess's law D. Law of conservation of energy

12) The amount of a substance produced during electrolysis by passing one Faraday of electricity is called:
A. Atomic weight B. Equivalent weight
C. Formula weight D. Empirical formula weight

13) What could be the geometrical shape of SF_6 according to $VSEPR$ theory?
A. Trigonal pyramidal B. Tetrahedral
C. Octahedral D. Trigonal bi pyramidal

14) Number of Hydrogen atoms in 1 mole of H_2O is:
A. 6.022×10^{23} B. $2\times6.022\times10^{23}$ C. $3\times6.022\times10^{23}$ D. $4\times6.022\times10^{23}$

15) Which of the following is NOT true for cathode rays?
A. Cathode rays are negatively charged
B. They can produce X-Rays when they strike on an anode
C. They cast a shadow when an opaque medium is placed in their path
D. Their e/m value depends upon the nature of gas in discharge tube

16) K_p, K_c, K_n and K_x are equilibrium constants in terms of pressure, concentration, moles and mole fraction. These constants can be equal when:
A. $\Delta n = 0$ B. $\Delta n = 1$ C. $\Delta n = 2$ D. $\Delta n = 3$

17) The solution in which pH is maintained, when a small amount of acid or base is added to it, is known as:
A. Aqueous solution B. Dilute solution
C. Concentrated solution D. Buffer solution

CHEMISTRY HSSC–I

Time allowed: 2:35 Hours **Total Marks Sections B, C and D: 68**

NOTE: The Questions of sections B, C and D are to be answered on the separately provided answer book. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly.

SECTION – B (Marks 21)

(Chapters 1 to 6)

Q. 2 Answer any SEVEN parts. All parts carry equal marks. **(7 x3 = 21)**

(i) How many covalent bonds are present in $16\,\text{grams}$ of O_2? (Molar mass of $O = 16$ gm/mol)

(ii) What is the relationship between:

a) Energy and wavelength

b) Frequency and wavelength

(iii) 1, 2-dichloroethene has cis and trans isomers.

a) Draw the structure of these isomers

b) Which of them will have $\mu = 0$? (where μ is dipole moment)

(iv) If $465\,cm^3$ of SO_2 can diffuse through porous partition in 30 seconds. How long will $620\,cm^3$ of H_2S take to diffuse through the same partition? [Atomic masses (amu): $H = 1, S = 32, O = 16$]

(v) Give any three properties of Plasma.

(vi) Differentiate between the following:

a) Isomorphism and polymorphism

b) Amorphous Solids and Crystalline Solids

(vii) Write the electronic configuration of the following with the help of '$n + l$' rule:

a) $_{25}Mn$

b) $_{13}Al^{3+}$

(viii) Speed of chemical reaction of covalent compound is slow as compared to ionic compound Justify the statement.

(ix) Briefly explain why the climate near large water bodies is moderate than interior of the land?

(x) A photon of light with energy $10^{-19}J$ is emitted by a source. Find the wave number ($\bar{\nu}$) associated with this energy. (Plank's constant = $6.625\times10^{-34}J.S$, Speed of light = $3.0\times10^{8}\,m.s^{-1}$)

SECTION – C (Marks 21)

(Chapters 7 to 12)

Q. 3 Answer any SEVEN parts. All parts carry equal marks. **(7 x3 = 21)**

(i) Predict the direction of reversible reaction if:

a) $Q = K_c$

b) $Q > K_c$

c) $Q < K_c$

Where $Q = \dfrac{[\text{product}]}{[\text{reactant}]}$ and K_c = Equilibrium constant

(ii) How many types of chemical equilibrium are there with respect to physical state of reactants and products? Give an example of each.

(iii) How many types of salts are there on the basis of reactivity with water? Give an example of each.

(iv) Calculate pOH of 0.001 M HCl solution.

(v) Define the following:

a) Rate equation

b) Order of reaction

(vi) (a) Indicate the Slow step (b) Determine the order of reaction (c) Write overall reaction, with the help of the information given below:

Rate $= k[NO_2]^2$

Step 1

$NO_{2(g)} + NO_{2(g)} \longrightarrow NO_{3(g)} + NO_{(g)}$

Step 2

$NO_{3(g)} + CO_{(g)} \longrightarrow NO_{2(g)} + CO_{2(g)}$

(vii) Describe Henry's law and give its one application.

(viii) Describe the difference between Heat capacity and Molar heat capacity.

(ix) Write oxidation and reduction half equations from the following redox equation.

$MnO_4^{-1} + Fe^{+2} \xrightarrow{\text{acid}} Fe^{+3} + Mn^{+2}$

(x) Is the following reaction feasible?(The standard reduction potential values are $E^0_{Sn} = -0.14\ V$ $E^0_{Fe} = -0.44\ V$

$Sn + Fe^{+2} \longrightarrow Sn^{+2} + Fe$

SECTION – D (Marks 26)

Note: Attempt any TWO questions. All questions carry equal marks. **(13 x 2 = 26)**

(Question 4 from Chapters 1 to 6)

Q. 4 **a.** What is surface tension? Also explain in detail the factors affecting it **(02+05)**

b. Define the type of solids to which the following substances belong:

i. Ice ii. Table salt iii. Diamond **(06)**

(Question 5 from Chapters 7 to 12)

Q. 5 **a.** $1.89\,g$ of an organic compound A was dissolved per $85\,cm^3$ of water ($density_{water} = 0.998\,gm\,cm^{-3}$). The boiling point under one atmospheric pressure of this solution is increased to $100.106\ ^\circ C$. What is the molecular mass of A ? **(05)**

b. Write the balanced chemical equation associated with each of the following: (values of ΔH° are not required) **(08)**

i. Standard enthalpy of sublimation of iodine.

ii. Standard enthalpy of formation of $C_2H_3Cl(g)$

iii. Standard enthalpy of combustion of benzene (l)

iv. Standard enthalpy of neutralization

(Question 6 Part (a) from Chapters 1 to 6 and Part (b) Chapters 7 to 12)

Q. 6 **a.** $NH_{3(g)}$ is obtained by the combination of $N_{2(g)}$ and $H_{2(g)}$ as shown by the following balanced equation. (Molar mass: Nitrogen = 14 , Hydrogen = 1 gm/mol) **(06)**

$N_{2(g)} + 3H_{2(g)} \longrightarrow 2NH_{3(g)}$

How many moles of N_2 and H_2 are required to manufacture $50g$ of NH_3 ?

b. Balance the following redox reaction by using oxidation number method. **(07)**

$P + HNO_3 \longrightarrow H_3PO_4 + NO$

CHEMISTRY HSSC–I

SECTION – A (Marks 17)

29

Time allowed: 25 Minutes

Version Number	1	8	5	1

Note: **Section – A is compulsory. All parts of this section are to be answered on the separately provided OMR Answer Sheet which should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.**

Q. 1 **Choose the correct answer A / B / C / D by filling the relevant bubble for each question on the OMR Answer Sheet according to the instructions given there. Each part carries one mark.**

1) Which of the following gases will occupy the highest volume at STP?
   A. 2 mole of H_2 B. 1.5 mole of O_2
   C. 1.0 mole of CO_2 D. 0.5 mole of NH_3

2) A necklace has 6g of diamond. How many atoms of carbon are present in it? (Molar mass of Carbon is $12\,gm/mol$)
   A. 6.022×10^{23} B. $2\times6.022\times10^{23}$ C. $\frac{1}{2}\times6.022\times10^{23}$ D. $\frac{2}{3}\times6.022\times10^{23}$

3) Indicate **inappropriate** set of quantum number:
   A. n=2, l=0, m=0, s=$-\frac{1}{2}$ B. n=2, l=1, m=0, s=$\frac{1}{2}$
   C. n=2, l=1, m=0, s=$-\frac{1}{2}$ D. n=1, l=1, m=0, s=$-\frac{1}{2}$

4) The bond order of nitrogen molecule ($N\equiv N$) is:
   A. 0 B. 1 C. 2 D. 3

5) Which law gives the following relationship? $P_1V_1=P_2V_2$ (T, n are constant) (where P, V and T are Pressure, Volume and absolute temperature, respectively)
   A. Boyle's law B. Avogadro's law C. Dalton's law D. Charles' law

6) Which of the following has highest value of surface tension?
   A. H_2O B. C_5H_{12} C. C_6H_{12} D. C_7H_{16}

7) Coordination numbers of Cl^{-1} ion and Na^{+1} ion in $NaCl$ crystal are:
   A. 5 and 6 B. 6 and 6 C. 6 and 4 D. 3 and 3

8) To obtain maximum yield in the given reaction indicate the appropriate reaction conditions:
   $$N_{2(g)}+3H_{2(g)} \rightleftharpoons 3NH_{3(g)} \quad \Delta H=-92.46\,kJ/mol$$
   A. High pressure, High temperature, Removal of H_2 from reaction mixture
   B. High pressure, Low temperature, Removal of NH_3 from reaction mixture
   C. Low pressure, Low temperature, Removal of N_2 from reaction mixture
   D. Low pressure, High temperature, Removal of H_2 from reaction mixture

9) Which of the following acids has highest pH value if their acidic strengths are as under:
   $$\xrightarrow[\text{Decreasing order}]{HCl>H_2SO_4>C_6H_5COOH>CH_3COOH}$$
   A. HCl B. H_2SO_4 C. C_6H_5COOH D. CH_3COOH

10) $H_2O_{(g)}+CO_{(g)} \rightleftharpoons H_{2(g)}+CO_{2(g)}$ The unit of K_c for the given reaction can be:
   A. $Mol.dm^{-3}$ B. $Mol^2.dm^{-6}$ C. $Mol^2.dm^6$ D. No unit

11) Which of the following has lowest boiling point at STP?
   A. Pure water B. 0.5 molar sugar solution of water
   C. 1.0 molar sugar solution of water D. 1.5 molar sugar solution of water

12) Born Haber cycle is used to determine lattice Energy of:
   A. Ionic solids B. Metallic solids C. Covalent solids D. Molecular solids

13) Oxidation number of S in $Na_2S_2O_3$ is:
   A. +1 B. +2 C. +3 D. +4

14) Which law is applicable during respiration by deep sea divers?
   A. Henry's law B. Dalton's law of partial pressure
   C. Graham's law of diffusion D. Boyle's law

15) In AB_4 molecule, there are four bond pairs and no lone pair around the central atom. Its molecular shape will be:
   A. Tetrahedral B. Trigonal planer C. V – shaped D. Trigonal pyramidal

16) If $K_{sp}=[M^{+2}]^3[X^{-3}]^2$, the chemical formula of the compound is:
   A. M_2X_2 B. M_2X_3 C. M_3X_2 D. MX_2

17) From the Millikan's oil drop experiment, it was concluded that:
   A. Neutron is neutral
   B. Charge on one electron is 1.6022×10^{-19} Coulomb
   C. Electrons are negatively charged
   D. e/m of Electron is 1.7588×10^{11} Coulombs/kg

30

CHEMISTRY HSSC–I

Time allowed: 2:35 Hours **Total Marks Sections B, C and D: 68**

NOTE: The Questions of sections B, C and D are to be answered on the separately provided answer book. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly.

SECTION – B (Marks 21)

(Chapters 1 to 6)

Q. 2 Answer any SEVEN parts. All parts carry equal marks. **(7 x3 = 21)**

(i) $C_6H_{12}O_{6(aq)} \longrightarrow 2C_2H_5OH_{(aq)} + 2CO_{2(g)}$ (Molar Mass of $C=12, H=1, O=16 (gm/mol)$)

a) What is theoretical yield of ethanol from $10.0\,g$ of glucose $(C_6H_{12}O_6)$?

b) If in a particular reaction, $10\,g$ of glucose $(C_6H_{12}O_6)$ produces $0.664\,g$ of ethanol (C_2H_5OH), Find the percentage yield of Ethanol.

(ii) What are $X, Y,$ and Z in the following reactions?

a) $_7N^{14} + _0n^1 \longrightarrow _5X^{11} + _2Y^4$

b) $_5B^{11} + _2He^4 \longrightarrow _7Z^{14} + _0n^1$

(iii) What could be the shape of the molecules having following electron pairs around central atom? Give examples.

No of lone pairs	No of bond pairs
0	4
1	3
2	2

(iv) "O_2 is paramagnetic and N_2 is diamagnetic in nature". How can you justify this statement by using molecular orbital theory?

(v) In a Pressure cooker, food can be cooked quickly, as compared to the simple cooker, Give reason.

(vi) How does the electron gas theory explain metallic bonding?

(vii) What is anisotropy? Explain briefly with example.

(viii) "Real gases deviate from the ideal behaviour at high pressure and low temperature". Give two valid reasons to explain this behaviour.

(ix) Find total pressure exerted by 2 grams of ethane (C_2H_6) and 3 grams of CO_2 contained in a $5\,dm^3$ vessel at $50°C$. (Molar mass of C, O and H are $12, 16, 1$ gm/mol, respectively; $R=0.0821\ atm.K^{-1}.mol^{-1}$)

(x) What is Pauli's exclusion principle?

SECTION – C (Marks 21)

(Chapters 7 to 12)

Q. 3 Answer any SEVEN parts. All parts carry equal marks. **(7 x3 = 21)**

(i) Predict the effect of change in pressure and temperature on the chemical equilibrium in the given reaction.

$$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)} \qquad \Delta H^\circ = -198\,kJ\ mol^{-1}$$

(ii) The solubility of $AgBr$ is $7.1\times10^{-7}\,M$ at $25\,°C$. Calculate its K_{sp}

(iii) Define the following:

a) Acid dissociation constant (K_a)

b) Base dissociation constant (K_b)

(iv) Which of the following reactions will show high rate of reaction? Also give reason.

$Zn_{(s)} + 2HCl_{(aq)} \longrightarrow ZnCl_{2(aq)} + H_{2(g)}$ (Zn in powdered form)

(OR)

$Zn_{(s)} + 2HCl_{(aq)} \longrightarrow ZnCl_{2(aq)} + H_{2(g)}$ (Zn in form of big pieces)

(v) Define the term "Water of crystallization". Also give two examples of it.

(vi) One molar aqueous solution of sugar is more concentrated as compared to one molal aqueous solution of sugar at room temperature. Justify the statement.

(vii) "The standard enthalpy of formation of $SO_{3(g)}$ is $-395.2 kJ/mol$". Show the given information with the help of a valid chemical equation.

(viii) What is electromotive force (emf)? Also define the term Volt.

(ix) Calculate E°_{cell} and also predict whether or not the cell is feasible:

$E^\circ_{Cathode} = -0.25\,V$

$E^\circ_{Anode} = -2.38\,V$

(x) How many types of salts are there? Give an example of each.

SECTION – D (Marks 26)

Note: Attempt any TWO questions. All questions carry equal marks. **(13 x 2 = 26)**

(Question 4 from Chapters 1 to 6)

Q. 4 **a.** What is viscosity? Explain the factors affecting it. **(02+05)**

b. Describe the differences between molecular orbital theory and valence bond theory. **(06)**

(Question 5 from Chapters 7 to 12)

Q. 5 **a.** What is Standard Hydrogen Electrode (SHE). Explain in detail. **(07)**

b. Define the following terms with examples: **(06)**

i. State function
ii. Heat Capacity
iii. Enthalpy of substance

(Question 6 Part (a) from Chapters 1 to 6 and Part (b) Chapters 7 to 12)

Q. 6 **a.** Calculate the following in $10g$ of NH_3 at STP (Molar masses: $N=14, H=1\ gm/mol$): **(06)**

i. Number of moles
ii. Number of molecules
iii. Volume in dm^3

b. What is Le-Chatelier's principle? Describe three major steps which could be taken in order to get maximum yield of NH_3 in Haber's process. **(02+05)**

COMPUTER SCIENCE HSSC–I

SECTION – A (Marks 15)

REVISED SYLLABUS

Time allowed: 20 Minutes | **Version Number** | 1 | 8 | 8 | 3 |

Note: Section – A is compulsory. All parts of this section are to be answered on the separately provided OMR Answer Sheet which should be completed in the first 20 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

Q. 1 Choose the correct answer A / B / C / D by filling the relevant bubble for each question on the OMR Answer Sheet according to the instructions given there. Each part carries one mark.

1) A record is also called _____ in RDBMS.
   A. Field B. Tuple C. Entity D. Attribute

2) What is the 'key field' called that is used in a relationship between tables whose value matches a primary key in another table?
   A. Alternate key B. Foreign key C. Candidate key D. Secondary key

3) Which of the following is **NOT** a productivity software?
   A. Word processor B. Graphics software
   C. Spreadsheet D. Windows

4) Which of the following is a pointing input device?
   A. Scanner B. Joystick C. Keyboard D. Plotter

5) Which of the following is a temporary memory?
   A. Flash B. PROM C. ROM D. RAM

6) 1 Kilo Byte = _____ Bytes.
   A. 2^{30} B. 2^{40} C. 2^{10} D. 2^{20}

7) Which of the following devices has sequential access to data?
   A. Magnetic tape B. Chip memory C. Magnetic disk D. Optical disk

8) Where are registers located?
   A. Inside DVD B. Inside CPU
   C. Inside Hard disk D. Inside memory

9) Where are the results of ALU operations transferred?
   A. Data register B. Accumulator register
   C. Counter register D. Base register

10) Which of the following provides interface to a computer network?
   A. Port B. BIOS C. NIC D. Modem

11) DSL stands for:
   A. Direct subscriber line B. Digital subscriber line
   C. Direct service line D. Data service line

12) In which communication mode data can be sent and received in both directions but not simultaneously?
   A. Full-duplex B. Synchronous C. Simplex D. Half-duplex

13) Which of the following transmission modes uses a start/stop bit for data transmission?
   A. Simplex B. Duplex C. Synchronous D. Asynchronous

14) Which orbit is located directly above the earth's equator?
   A. LEO B. GALILEO C. GEO D. MEO

15) Duplication of data in different files is called:
   A. Data redundancy B. Data deficiency
   C. Data inconsistency D. Data overflow

COMPUTER SCIENCE HSSC–I

Time allowed: 2:40 Hours **Revised Syllabus** **Total Marks Sections B, C and D: 60**

NOTE: The Questions of sections B, C and D are to be answered on the separately provided answer book. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly.

SECTION – B (Marks 21)

Note: Section – B consists of following topics of the syllabus:

1.	Overview of Computer System	**2.**	Computer Memory
3.	Central Processing Unit	**4.**	Inside System Unit

Q. 2 Answer any SEVEN parts. All parts carry equal marks. **(7 x3 = 21)**

(i) Give any three application areas of supercomputers.

(ii) What is IoT (Internet of Things)?

(iii) Write any three differences between DRAM and SRAM.

(iv) Why data access time in sequential access devices is more than that in random access devices?

(v) Give any three advantages of using flash memory.

(vi) What is the function of control unit in a computer?

(vii) Give any three differences between CISC and RISC architectures.

(viii) What is the function of BIOS in a computer?

(ix) What is the function of SATA interface on the motherboard?

(x) Give any three differences between SIMM and DIMM.

SECTION – C (Marks 21)

Note: Section – C consists of following topics of the syllabus:

5.	Network communication Protocol	**6.**	Wireless Communication
7.	Database Fundamentals	**8.**	Database Development

Q. 3 Answer any SEVEN parts. All parts carry equal marks. **(7 x3 = 21)**

(i) Define any three basic network components.

(ii) Give one example each of simplex, half-duplex and full-duplex communication modes.

(iii) Give any three characteristics of VPN (Virtual Private Network).

(iv) Give any three advantages of wireless networks.

(v) What is Wi-Max?

(vi) Give any three limitations of mobile communication systems.

(vii) Give any three advantages of DBMS over file management system.

(viii) A company sells many products to their customers. There are many suppliers who supply various products. Draw an ER-diagram of entities; Company, Supplier and Customer.

(ix) Differentiate between cardinality and modality.

(x) Give any three advantages of using Forms in Access database.

SECTION – D (Marks 18)

Note: Attempt any THREE questions. All questions carry equal marks. **(3 x 6 = 18)**

Q. 4 What is a computer software? Explain System software and Application software in detail by giving examples. **(1+5)**

Q. 5 What is secondary memory? Explain any two secondary memory devices in detail. **(1+5)**

Q. 6 Describe the purpose of the following types of ports in a computer system; **(2+2+2)**

i. USB port **ii.** Fire Wire port **iii.** HDMI port

Q. 7 What is network topology? Explain Star, Ring and Bus topologies with suitable diagrams. **(01+03+02)**

COMPUTER SCIENCE HSSC–I

SECTION – A (Marks 15)

(Old Syllabus)

Time allowed: 20 Minutes | **Version Number** | 1 | 8 | 8 | 8 |

Note: **Section – A is compulsory. All parts of this section are to be answered on the separately provided OMR Answer Sheet which should be completed in the first 20 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.**

Q. 1 **Choose the correct answer A / B / C / D by filling the relevant bubble for each question on the OMR Answer Sheet according to the instructions given there. Each part carries one mark.**

1. In which of the following ways can the text **NOT** be aligned in the main text?
   A. Right B. Centre C. Top D. Left
2. By default, how many worksheets are present in MS Excel Workbook?
   A. 4 B. 5 C. 2 D. 3
3. The speed of laser printer is measured in:
   A. Pages per minute B. Lines per minute
   C. Characters per second D. Words per minute
4. Another name for main memory is:
   A. Cache memory B. Primary memory
   C. Secondary memory D. Permanent memory
5. What type of network is the internet?
   A. WAN B. Not a network C. LAN D. MAN
6. The layer that is concerned with addressing and routing is called:
   A. Physical B. Transport C. Network D. Data Link
7. ISDN stands for:
   A. Intranet Services Digital Network B. Integrated Services Digital Network
   C. Internet Services Digital Network D. Improved Speed Digital Network
8. Start/Stop bits are not required in _____ type of transmission.
   A. Synchronous B. Asynchronous C. Digital D. Analog
9. Many banks provide the facility of:
   A. ATM B. CBT C. CAD D. CAM
10. Fetch, decode and execute the instructions is the function of:
    A. ROM B. CU C. ALU D. RAM
11. The address bus is:
    A. Multi directional B. Circular C. Bidirectional D. Unidirectional
12. Input/Output devices are also called as:
    A. Attached devices B. Network devices
    C. Peripheral devices D. Central devices
13. The capability of an operating system to run two or more programs at once is called:
    A. Multi-operating B. Multi-paging
    C. Multi-processing D. Multi-tasking
14. Software can be removed/inserted through:
    A. Debugger B. Linker C. Control panel D. Compiler
15. Which of the following is **NOT** an example of antivirus program?
    A. Dr. Solomon B. Chernobyl C. Norton D. McAfee

COMPUTER SCIENCE HSSC–I

(Old Syllabus)

Time allowed: 2:40 Hours **Total Marks Sections B, C and D: 60**

NOTE: The Questions of sections B, C and D are to be answered on the separately provided answer book. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly.

SECTION – B (Marks 21)

Note: Section – B consists of following topics of the syllabus:

a. Basic concepts of IT **b.** Data Communication
c. Hardware and System Software **d.** Information Networks
e. Applications and use of computers

Q. 2 Answer any SEVEN parts. All parts carry equal marks. **(7 x3 = 21)**

(i) Briefly explain the role of main memory in a computer system.
(ii) Differentiate between CAD and CAM.
(iii) How can computer be useful in education?
(iv) Distinguish between static memory devices and dynamic memory devices.
(v) Write two advantages of using plotter over printers. Also write one drawback of plotter
(vi) What is groupware and workgroup computing?
(vii) What is bandwidth? Differentiate between Narrowband and Broadband.
(viii) What are the advantages of Dedicated Server Networks over Peer to Peer Networks?
(ix) Define system software. Briefly describe any two of its categories.
(x) In which type of network do we use TCP/IP and why?

SECTION – C (Marks 21)

Note: Section – C consists of following topics of the syllabus:

a. Security copyright and the law **b.** Operating systems (Windows)
c. Word processing (using MS-Word 2000) **d.** Spreadsheet (Using MS-Excel 2000)
e. Internet, Internet browsing and E-mail

Q. 3 Answer any SEVEN parts. All parts carry equal marks. **(7 x3 = 21)**

(i) How can we protect our data from viruses?
(ii) What is copyright? What types of works are protected by copyright?
(iii) Distinguish between Internet Explorer and Windows Explorer.
(iv) Briefly Explain any three important features of Word Processor.
(v) What are the rules to set names for file and folder in Windows?
(vi) Distinguish between insert and overtype modes for entering text in a Word Processor.
(vii) Differentiate between a formula and a function in spread sheet programs.
(viii) What do you know about web page and web server?
(ix) Define E-mail. Give some limitations of using E-mail.
(x) Mention any three application areas where spread sheet can be useful.

SECTION – D (Marks 18)

Note: Attempt any THREE questions. All questions carry equal marks. **(3 x 6 = 18)**

Q. 4 Describe any three network topologies with the help of diagrams. **(2+2+2)**

Q. 5 What are the types of buses used in the computer circuits? Also explain their functions. **(1.5+4.5)**

Q. 6 Explain the following terms with reference to MS Word: **(2+2+2)**

i. Word Wrap **ii.** Thesaurus **iii.** Headers and Footers

Q. 7 **(a)** Distinguish between Impact and Non-Impact printers. **(2)**

(b) Write short notes on: **(2+2)**

i. Computer Simulation **ii.** Weather forecast

MATHEMATICS HSSC–I

SECTION – A (Marks 20)

37

Time allowed: 25 Minutes | **Version Number** | 1 | 8 | 7 | 1 |

Note: **Section – A is compulsory. All parts of this section are to be answered on the separately provided OMR Answer Sheet which should be completed In the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.**

Q. 1 **Choose the correct answer A / B / C / D by filling the relevant bubble for each question on the OMR Answer Sheet according to the instructions given there. Each part carries one mark.**

1) What is the value of i^{13} ?

A. $-i$ B. i C. 1 D. -1

2) How many inverse elements correspond to each element of group?

A. At least two B. Only one C. At least one D. Two

3) If A is any Matrix of order $m \times n$ then minor of matrix of any one element has order:

A. $m \times n$ B. $(m-1) \times n$ C. $m \times (n-1)$ D. $(m-1) \times (n-1)$

4) What is the value of $\left(-1+\sqrt{3}.i\right)^4 + \left(-1-\sqrt{3}.i\right)^4$?

A. 16 B. -16 C. 4 D. -4

5) The partial fraction of $\frac{1}{1+x^3}$ will be in the form of:

A. $\frac{A}{1-x} + \frac{Bx+C}{1+x+x^2}$ B. $\frac{A}{(1+x)} + \frac{Bx+C}{(1+x^2)}$

C. $\frac{A}{x+1} + \frac{C+Bx}{x^2-x+1}$ D. $\frac{A}{x+1} + \frac{Bx+C}{x^2+x+1}$

6) What is the value of S_{19} if terms of of $A.P$ are $2+\frac{7}{2}+5+\frac{13}{2}+.....19th$

A. $\frac{129}{2}$ B. $\frac{529}{2}$ C. $\frac{829}{2}$ D. $\frac{589}{2}$

7) What is the value of n, if ${}^{n}C_8 = {}^{n}C_{12}$?

A. 8 B. 12 C. 4 D. 20

8) What is the term independent of a in the expension of $\left(\frac{a}{2}-\frac{2}{a}\right)^6$?

A. $\frac{15}{4}$ B. -20 C. $\frac{-15}{4}$ D. 20

9) What is the Arc length if an arc subtends an angle $60°20'$ with radius $18mm$?

A. 20.6 B. 20.5 C. 25.5 D. 26.5

10) What is the value of $\sin 9\theta$?

A. $4\cos^3\theta - 3\cos^3\theta$ B. $3\cos^3 3\theta - 4\cos 3\theta$

C. $3\sin 3\theta - 4\sin^3 3\theta$ D. $4\sin 3\theta - 3\sin^3\theta$

11) What is the value of $\cos\left(\frac{3\pi}{2}+\theta\right)$?

A. $\cos\theta$ B. $\sin\theta$ C. $-\sin\theta$ D. $-\cos\theta$

12) In a triangle if $a=17, b=10, c=21$, then what is the value of R?

A. $\frac{85}{8}$ B. $\frac{83}{8}$ C. $\frac{81}{8}$ D. $\frac{87}{8}$

13) What is the value of $\frac{\pi}{2}-\sin^{-1}x$?

A. $\sin^{-1}x$ B. $-\sin^{-1}x$ C. $\cos^{-1}x$ D. $-\cos^{-1}x$

14) What is the representation of conjuction of two statements $p \& q$?

A. $p\wedge q$ B. $p\vee q$ C. $p\rightarrow q$ D. $p\leftrightarrow q$

15) If a sequence has condition $a_n - a_{n-1} = n+1,\ a_4 = 14$ then a_5 has value:

A. 16 B. 20 C. 26 D. 24

16) $\frac{\sqrt{(S-b)(S-c)}}{\sqrt{S(S-a)}} = ?$

A. $\sin\frac{\alpha}{2}$ B. $\tan\frac{\beta}{2}$ C. $\tan\frac{\gamma}{2}$ D. $\tan\frac{\alpha}{2}$

17) What is the range of $\cot^{-1}(x)$?

A. $-1<x<1$ B. $0\le x\le\pi$ C. $0<x<\pi$ D. $-\frac{\pi}{2}<x<\frac{\pi}{2}$

18) What is the multiplicative inverse of $1-2i$?

A. $\frac{1-2i}{4}$ B. $\frac{1+2i}{5}$ C. $\frac{1+2i}{\sqrt{5}}$ D. $\frac{1-2i}{\sqrt{5}}$

19) The solution set of $\cos x - \sin x = 0$ in $[0,\pi]$ is:

A. $\frac{5\pi}{4}$ B. $\frac{\pi}{3}$ C. $\frac{\pi}{4}$ D. $\frac{5\pi}{3}$

20) What is the rank of $\begin{bmatrix}1 & 2 & 5\\ 0 & 0 & 0\\ 3 & 2 & 0\end{bmatrix}$

A. 3 B. 2 C. 1 D. 0

MATHEMATICS HSSC–I

Time allowed: 2:35 Hours **Total Marks Sections B and C: 80**

NOTE: Attempt any ten parts from Section 'B' and any five questions from Section 'C' on the separately provided answer book. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly. Graph paper will be provided on request.

SECTION – B (Marks 40)

Q. 2 Attempt any TEN parts. All parts carry equal marks. **(10 x 4 = 40)**

(i) If $Z_1 = 2+i,\ Z_2 = 3+2i,\ Z_3 = 1+3i$ then find the value of $\frac{\overline{Z}_1 \cdot \overline{Z}_2}{Z_3}$ in form of $a+bi$

(ii) By using truth table prove that $p \vee (\sim p \wedge \sim q) \vee (p \wedge q) = p \vee (\sim p \wedge \sim q)$

(iii) Show that $\begin{vmatrix} x & 1 & 1 & 1 \\ 1 & x & 1 & 1 \\ 1 & 1 & x & 1 \\ 1 & 1 & 1 & x \end{vmatrix} = (x+3)(x-1)^3$

(iv) Solve the Equation $4 \cdot 2^{2x+1} - 9 \cdot 2^x + 1 = 0$

(v) Resolve into partial fraction $\frac{2x+1}{(x+3)(x-1)(x+2)^2}$

(vi) Find the sum to n^{th} term of series $r + (1+k)r^2 + (1+k+k^2)r^3 + \ldots\ldots n$

(vii) Find the number greater than 23000 that can be formed from digit $1, 2, 3, 5, 6$ without repeating any digit.

(viii) If x is so small that its square and higher powers may be neglected then show that

$$\frac{(1+x)^{\frac{1}{2}}(4-3x)^{\frac{3}{2}}}{(8+5x)^{\frac{1}{3}}} \approx 4\left(1-\frac{5x}{6}\right)$$

(ix) Find correct to nearest centimeter distance at which a coin of diameter $1cm$ should be held so as to conceal the full moon whose diameter subtends an angle of $31'$ at the eye of observer on the earth.

(x) Prove that $\sqrt{\frac{1+\sin\alpha}{1-\sin\alpha}} = \frac{\sin\frac{\alpha}{2} + \cos\frac{\alpha}{2}}{\sin\frac{\alpha}{2} - \cos\frac{\alpha}{2}}$

(xi) Draw the graph of $y = \cos x$ from 0 to 2π

(xii) By using usual notation prove that $r_1 = \frac{\Delta}{s-a}$

(xiii) Show that $\cos^{-1}(-x) = \pi - \cos^{-1} x$

(xiv) Find the solution set of $\sin 3x + \sin 2x + \sin x = 0$

SECTION – C (Marks 40)

Note: Attempt any FIVE questions. All questions carry equal marks. **(5 x 8 = 40)**

Q. 3 Use Matrices to solve the system of equations

$$2x_1 + x_2 + 3x_3 = 3$$
$$x_1 + x_2 - 2x_3 = 0$$
$$-3x_1 - x_2 + 2x_3 = -4$$

Q. 4 Solve the system of equation

$$x^2 - y^2 = 5$$
$$4x^2 - 3xy = 18$$

Q. 5 If the numbers $\frac{1}{2}, \frac{4}{21}$ and $\frac{1}{36}$ are subtracted from three consecutive term of G.P the resulting numbers are in H.P. Find the numbers if their product is $\frac{1}{27}$.

Q. 6 Identify the following Series and find its sum. $1 - \frac{1}{2}\left(\frac{1}{2}\right) + \frac{1\cdot 3}{2\cdot 4}\left(\frac{1}{2}\right)^2 - \frac{1\cdot 3\cdot 5}{2\cdot 4\cdot 6}\left(\frac{1}{2}\right)^3 + \ldots\ldots$

Q. 7 Find the value of $\sin(\alpha+\beta)$ and $\cos(\alpha+\beta)$ if $\tan\alpha = \frac{-15}{8}$ and $\sin\beta = \frac{-7}{25}$, neither α nor β lie in $4th$ quadrant.

Q. 8 Prove that $\cos^{-1}\frac{63}{65} + 2\tan^{-1}\frac{1}{5} = \sin^{-1}\frac{3}{5}$

Q. 9 Show that the set consisting of elements of form $\{a+\sqrt{3}b$ (a, b being rational)$\}$ is an abelian group w.r.t addition.

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MATHEMATICS HSSC–I

SECTION – A (Marks 20)

Time allowed: 25 Minutes

Version Number	1	8	7	8

Note: **Section – A is compulsory. All parts of this section are to be answered on the separately provided OMR Answer Sheet which should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.**

Q. 1 **Choose the correct answer A / B / C / D by filling the relevant bubble for each question on the OMR Answer Sheet according to the instructions given there. Each part carries one mark.**

1) In a matrix $A=\begin{bmatrix}1 & 4 & 7\\ 2 & 5 & 8\\ 3 & 6 & 9\end{bmatrix}$ what is value of A_{12} ?

A. 9 B. -9 C. 6 D. -6

2) If $r=n$ or $r=0$ what is the value of ${}^{n}C_{r}$?

A. 0 B. r C. 1 D. n

3) What is the value of $\frac{2}{1-i}$?

A. $2(1+i)$ B. $2(1-i)$ C. $1+i$ D. $1-i$

4) If set A has 5 elements, then how many binary relations are in $A\times A$?

A. 2^{25} B. $2^{25}-1$ C. 25 D. 2^{5}

5) If A is a matrix of order $m\times n$ and B is a matrix of order $n\times l$, then what is order of matrix $A\times B$?

A. $m\times n$ B. $l\times m$ C. $l\times n$ D. $m\times l$

6) What is the product of root of quadratic equation $x^{2}-3x+6=0$?

A. 6 B. -6 C. 3 D. -3

7) What is the partial fraction of $\frac{7x+25}{(x+3)(x+4)}$?

A. $\frac{4}{x+3}-\frac{3}{x+4}$ B. $\frac{4}{x+4}-\frac{3}{x+3}$ C. $\frac{4}{x+3}+\frac{3}{x+4}$ D. $\frac{4}{x+4}+\frac{3}{x+3}$

8) What is the sum of infinite G.P $2,\sqrt{2},1,....$?

A. $4-\sqrt{2}$ B. $4+2\sqrt{2}$ C. $2\sqrt{2}$ D. $2+2\sqrt{2}$

9) What is the value of $r!{}^{n}C_{r}$?

A. ${}^{n+1}P_{r}$ B. ${}^{n-1}C_{r}$ C. ${}^{n}P_{r}$ D. ${}^{n+1}C_{r}$

10) For what value of n the expression $3^{n}>n!$ is **UNTRUE** if $n\in Z$

A. $n=6$ B. $n=7$ C. $n=2$ D. $n=3$

11) Which of the following angles are coterminal?

A. $\frac{\pi}{3},\frac{4\pi}{3}$ B. $\frac{\pi}{3},\frac{5\pi}{6}$ C. $\frac{\pi}{3},\frac{13\pi}{3}$ D. $\frac{5\pi}{3},\frac{\pi}{3}$

12) What is the value of $\tan 3\theta$?

A. $\frac{3\tan\theta+\tan^3\theta}{1+3\tan^2\theta}$ B. $\frac{3\tan\theta-\tan^3\theta}{1-3\tan^2\theta}$ C. $\frac{3\tan\theta+\tan^3\theta}{1-3\tan\theta}$ D. $\frac{3\tan\theta-\tan^3\theta}{1+3\tan\theta}$

13) What is the period of $3\cos\frac{x}{5}$?

A. 13π B. 10π C. $\frac{15\pi}{3}$ D. $\frac{13\pi}{5}$

14) What is the range of Function $y=\cot x$?

A. $-1\le y\le 1$ B. $-1\le x\le 1$ C. $-\infty<x<\infty$ D. $-\infty<y<\infty$

15) What is the value of r_2 ?

A. $S\tan\frac{r}{2}$ B. $S\tan\beta$ C. $S\tan\frac{\alpha}{2}$ D. $S\tan\frac{\beta}{2}$

16) What is solution of $1+\cos x=0$ for complete period?

A. $\{-\pi+n\pi\}$ B. $\{\pi+n\pi\}$ C. $\{-\pi+2n\pi\}$ D. $\{\pi+2n\pi\}$

17) What is the area of triangle in Square Uints if $b=21.6 \quad c=30.2 \quad \alpha=52°40'$?

A. 295.3 B. 952.3 C. 259.3 D. 529.3

18) A die is rolled, what is the probability that dots on top are greater than 4 ?

A. $\frac{1}{6}$ B. $\frac{1}{3}$ C. $\frac{1}{2}$ D. $\frac{1}{4}$

19) What is the multiplicative inverse of $1+2i$?

A. $\frac{1}{\sqrt{5}}(1-2i)$ B. $\frac{1}{5}(1-2i)$ C. $\frac{1}{5}(1+2i)$ D. $\frac{1}{4}(1-2i)$

20) What is value of $\tan^{-1}x$?

A. $\frac{\pi}{2}+\cot^{-1}x$ B. $\frac{\pi}{2}+\tan^{-1}x$ C. $\frac{\pi}{2}-cot^{-1}x$ D. $\frac{\pi}{2}-\tan^{-1}x$

MATHEMATICS HSSC–I

Time allowed: 2:35 Hours **Total Marks Sections B and C: 80**

NOTE: Attempt any ten parts from Section 'B' and any five questions from Section 'C' on the separately provided answer book. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly. Graph paper will be provided on request.

SECTION – B (Marks 40)

Q. 2 Attempt any TEN parts. All parts carry equal marks. **(10 x 4 = 40)**

(i) Separate into real and imaginary part $\frac{(-2+3i)^2}{1+i}$

(ii) If $S=\{1,-1,i,-i\}$ show that S is abelian group under multiplication.

(iii) Show $\begin{vmatrix} b+c & a & a^2 \\ c+a & b & b^2 \\ a+b & c & c^2 \end{vmatrix} = (a+b+c)(a-b)(b-c)(c-a)$

(iv) Solve the system of equation $3x+4y=25, \frac{3}{x}+\frac{4}{y}=2$

(v) Resolve into Partial fraction $\frac{4x}{(x+1)^2(x-1)}$

(vi) Obtain the sum of all Integers in the first 1000 integers which are neither divisible by 5 nor by 2

(vii) Prove that ${}^nC_r + {}^nC_{r-1} = {}^{n+1}C_r$

(viii) Find the term Independent of x in the expression of $\left(1+x^2\right)^3\left(1+\frac{1}{x^2}\right)^4$

(ix) If $\cot\theta=\frac{5}{2}$ and terminal arm of angle is in 1st quadrant then find the value of $\frac{3\sin\theta+4\cos\theta}{\cos\theta-\sin\theta}$

(x) If α,β,γ are the angles of triangle ABC, then show that $\cot\frac{\alpha}{2}+\cot\frac{\beta}{2}+\cot\frac{\gamma}{2}=\cot\frac{\alpha}{2}\cot\frac{\beta}{2}\cot\frac{\gamma}{2}$

(xi) Prove that $\frac{\operatorname{cosec}\theta+2\operatorname{cosec}2\theta}{\sec\theta}=\cot\frac{\theta}{2}$

(xii) Prove that $r=\frac{\Delta}{S}$ (with usual notation)

(xiii) Prove that $2\tan^{-1}\frac{1}{3}+\tan^{-1}\frac{1}{7}=\frac{\pi}{4}$

(xiv) Find the solution set of $3\cos^2\theta-2\sqrt{3}\sin\theta\cos\theta-3\sin^2\theta=0$

SECTION – C (Marks 40)

Note: Attempt any FIVE questions. All questions carry equal marks. **(5 x 8 = 40)**

Q. 3 Solve the following system of equation by reducing the augmented matrix into reduced echelon forms.

$x+2y+z=2$
$2x+y+2z=-1$
$2x+3y-z=9$

Q. 4 Solve the equation: $\sqrt{x^2+4x-21}+\sqrt{x^2-x-6}=\sqrt{6x^2-5x-39}$

Q. 5 If three consecutive number in an $A.P.$ are increased by $1,4,15$ respectively the resulting number are in G.P. Find the original number if their sum is 6.

Q. 6 If $y=\frac{1}{3}+\frac{1.3}{2!}\left(\frac{1}{3}\right)^2+\frac{1.3.5}{3!}\left(\frac{1}{3}\right)^3+\ldots\ldots$ then prove that $y^2+2y-2=0$

Q. 7 Prove that $\sin\frac{\pi}{9}\sin\frac{2\pi}{9}\sin\frac{\pi}{3}\sin\frac{4\pi}{9}=\frac{3}{16}$

Q. 8 Prove that $r_1+r_2+r_3-r=4R$

Q. 9 Find the solution set of $\cos 2x=\sin 3x$

PHYSICS HSSC–I

SECTION – A (Marks 17)

23

Time allowed: 25 Minutes

Version Number	1	8	3	8

Note: **Section – A is compulsory. All parts of this section are to be answered on the separately provided OMR Answer Sheet which should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.**

Q. 1 **Choose the correct answer A / B / C / D by filling the relevant bubble for each question on the OMR Answer Sheet according to the instructions given there. Each part carries one mark.**

1) For an ideal gas, the internal energy is directly proportional to:
A. Volume B. Density C. Pressure D. Temperature

2) Thermal pollution is an inevitable consequence of:
A. First law of thermodynamics B. Newton's third law
C. 2nd law of thermodynamics D. Pascal's law

3) The Prefix one peta is:
A. 10^{9} B. 10^{18} C. 10^{15} D. 10^{12}

4) Counter clockwise Torque is:
A. Zero B. Infinite C. Negative D. Positive

5) If $\vec{A} = a\hat{i}$ and $\vec{B} = a\hat{j}$ then:
A. $\vec{A}\cdot\vec{B} = -a$ B. $\vec{A}\cdot\vec{B} = 0$ C. $\vec{A}\cdot\vec{B} = a$ D. $\vec{A}\cdot\vec{B} = a^2$

6) The motion and rest are:
A. Discrete B. Random C. Absolute D. Relative

7) The fuel consumed by a typical rocket to provide enough upward thrust to overcome gravity is:
A. $10000 kghr^{-1}$ B. $10000 kgs^{-1}$ C. $10000 gs^{-1}$ D. $10000 kg\,\min^{-1}$

8) When the angle between force and displacement is greater than 90°, the work done is:
A. Negative B. Positive C. Maximum D. Zero

9) Which of the following is non-conservative force?
A. Electric force B. Elastic spring force
C. Gravitational force D. Normal force

10) SI unit of angular momentum is:
A. Nm B. $Radian$ C. Ns D. Js

11) Bernoulli's equation is based on the law of conservation of:
A. Charge B. Momentum C. Mass D. Energy

12) If radius of the droplet is doubled, the terminal velocity increases:
A. Four times B. Eight times C. Two times D. Three times

13) Tuning of a radio is an example of:
A. Musical resonance B. Magnetic resonance
C. Mechanical resonance D. Electrical resonance

14) If a transverse wave, travelling in a rarer medium, is reflected from a denser medium, it undergoes a path difference of:
A. $\frac{\lambda}{2}$ B. λ C. $\frac{\lambda}{8}$ D. $\frac{\lambda}{4}$

15) A diffraction grating has 5000 lines per cm. Its grating element is:
A. $2\times10^{-3} cm$ B. $0.2\times10^{-3} cm$ C. $200\times10^{-3} cm$ D. $20\times10^{-3} cm$

16) For light of wavelength λ through a lens of diameter D, the resolving power is given by:
A. $1.22\frac{D}{\lambda}$ B. $\frac{\lambda}{1.22D}$ C. $1.22\frac{\lambda}{D}$ D. $\frac{D}{1.22\lambda}$

17) The Bragg equation is given as:
A. $2d\sin\theta = n\lambda$ B. $2n\sin\theta = d\lambda$ C. $d\sin\theta = n\lambda$ D. $n\sin\theta = d\lambda$

PHYSICS HSSC–I

Time allowed: 2:35 Hours **Total Marks Sections B, C and D: 68**

NOTE: Answer any seven parts each from section B and C and any two questions from section D on the separately provided answer book. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly.

SECTION – B (Marks 21)
(Chapters 1 to 6)

Q. 2 Answer any SEVEN parts. All parts carry equal marks. **(7 x3 = 21)**

(i) Show that the expression $v_f = v_i + at$ is dimensionally correct, where v_i is the velocity at $t = 0$ and v_f is the velocity at time t.

(ii) Give the drawbacks to use the period of pendulum as a time standard.

(iii) If one of the rectangular components of vector is not zero. Can its magnitude be zero? Explain briefly.

(iv) Define unit vector and find the unit vector in the direction of vector $\vec{A} = 4\hat{i} + 3\hat{j}$.

(v) Can the velocity of an object reverse the direction when acceleration is constant? If so, give an example.

(vi) Find the angle of projection of projectile for which its maximum height and horizontal range are equal.

(vii) An object has $1J$ of P.E. What does it mean?

(viii) A girl drops a cup form a certain height, which breaks. What energy changes are involved?

(ix) What is meant by angular momentum? Show that $Lo = mvr$.

(x) A person is standing near a fast moving train. Is there any danger that he will fall towards it? Explain briefly.

SECTION – C (Marks 21)
(Chapters 7 to 11)

Q. 3 Answer any SEVEN parts. All parts carry equal marks. **(7 x3 = 21)**

(i) Does the acceleration of a simple harmonic oscillator remain constant during its motion? Is the acceleration ever zero? Explain briefly.

(ii) Define resonance and name any two phenomena in which resonance is involved.

(iii) Why does sound travel faster in warm air than in cold air? Explain briefly.

(iv) Define the terms crest, trough and node.

(v) Define coherent sources. Under what conditions two sources of light behave as coherent sources?

(vi) In a double slit experiment, the second order maximum occurs at $\theta = 0.025°$. The wavelength is $650nm$. Find the slit separation.

(vii) What do you understand by linear magnification and angular magnification? Write the equations as well.

(viii) How is the light signal transmitted through the optic fibre?

(ix) Show that $Cp - Cv = R$

(x) Is it possible to convert internal energy into mechanical energy. Explain briefly with an example.

SECTION – D (Marks 26)

Note: Attempt any TWO questions. All questions carry equal marks. **(13 x 2 = 26)**

Q. 4 **a.** Define scalar product and vector product. Write down two examples and four characteristics of each. **(1+1+4)**

b. Discuss conditions of equilibrium. **(04)**

c. Find the angle between two vectors $\vec{A} = 5\hat{i} + \hat{j}$ and $\vec{B} = 2\hat{i} + 4\hat{j}$ **(03)**

Q. 5 **a.** What are stationary waves? How are stationary waves generated? Discuss stationary waves in a stretched string. **(1+1+4)**

b. What are applications of Doppler's Effect? Discuss briefly. **(04)**

c. An organ pipe has a length of $50cm$. Find the frequency of fundamental note when it is open at both ends. (Speed of sound= $350ms^{-1}$) **(03)**

Q. 6 **a.** What is compound microscope? Discuss its working and find out its magnifying power. **(1+2+3)**

b. Discuss different types of optic fibre. **(04)**

c. A telescope is made of an objective of focal length $20cm$ and an eye piece of focal length $5cm$. Find the angular magnification. **(03)**

—— 1HA 1808 (L)——

PHYSICS HSSC–I

SECTION – A (Marks 17)

25

Time allowed: 25 Minutes

Version Number	1	8	4	3

Note: **Section – A is compulsory. All parts of this section are to be answered on the separately provided OMR Answer Sheet which should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.**

Q. 1 **Choose the correct answer A / B / C / D by filling the relevant bubble for each question on the OMR Answer Sheet according to the instructions given there. Each part carries one mark.**

1) The efficiency of diesel engine is about:
A. 30% to 35% B. 25% to 30% C. 45% to 50% D. 35% to 40%

2) The entropy of universe always:
A. Increases and decreases simultaneously B. Remains constant
C. Increases D. Decreases

3) One year is equal to:
A. $3.15\times10^{7}s$ B. $5.4\times10^{4}s$ C. $1.41\times10^{17}s$ D. $8.6\times10^{4}s$

4) SI unit of Torque is:
A. Ns B. JC^{-1} C. Js D. Nm

5) In case of unit vectors $\hat{i},\hat{j}$ and $\hat{k}$. Which of the following is valid?
A. $\hat{j}\times\hat{i}=0$ B. $\hat{j}\times\hat{i}=1$ C. $\hat{j}\times\hat{i}=-\hat{k}$ D. $\hat{j}\times\hat{i}=\hat{k}$

6) The change in position of a body from initial position to final position is called:
A. Displacement B. Acceleration C. Position vector D. Velocity

7) The notation delta (Δ) is used to represent a:
A. Small change B. Big change
C. Zero change D. Very small change

8) $1kWh$ is equal to:
A. $3.6\times10^{6}J$ B. $3.6\times10^{-6}J$ C. $3.60\times10^{9}J$ D. $3.6\times10^{-9}J$

9) If angle 'θ' is greater than $90°$, the work done is:
A. Maximum B. Positive C. Zero D. Negative

10) Moment of inertia of a thin rod about its length is:
A. $\frac{1}{12}mL^{4}$ B. $\frac{2}{5}mL^{2}$ C. $\frac{1}{12}mL^{2}$ D. $\frac{1}{12}mL^{3}$

11) The device used to measure the speed of liquid flow is called:
A. Speedometer B. Spectrometer C. Barometer D. Venturimeter

12) The dimensions of flow rate are:
A. $[L^{-1}T^{-3}]$ B. $[L^{-1}T^{-2}]$ C. $[L^{3}T^{-1}]$ D. $[L^{2}T^{-1}]$

13) For $1°C$ rise in temperature, the speed of sound increases by:
A. $0.61ms^{-1}$ B. $0.061ms^{-1}$ C. $61ms^{-1}$ D. $6.1ms^{-1}$

14) To double the period of simple pendulum, its length must be:
A. Increased two times B. Increased four times
C. Decreased by $\frac{1}{3}$ D. Decreased by $\frac{1}{2}$

15) In Michelson's interferometer, a fringe is shifted, each time the mirror is displaced through:
A. λ B. $\frac{\lambda}{2}$ C. $\frac{\lambda}{8}$ D. $\frac{\lambda}{4}$

16) In normal adjustment, the length of astronomical telescope is:
A. $\frac{1}{f_o+f_e}$ B. $\frac{f_e}{f_o}$ C. $\frac{f_o}{f_e}$ D. f_o+f_e

17) Multimode step index fibre has a core of:
A. $50\mu m$ B. $1000\mu m$ C. $0.5\mu m$ D. $5\mu m$

PHYSICS HSSC–I

26

Time allowed: 2:35 Hours **Total Marks Sections B, C and D: 68**

NOTE: Answer any seven parts each from section B and C and any two questions from section D on the separately provided answer book. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly.

SECTION – B (Marks 21)
(Chapters 1 to 6)

Q. 2 Answer any SEVEN parts. All parts carry equal marks. **(7 x3 = 21)**

(i) Check the correctness of the relation $V=\sqrt{\frac{F\times l}{m}}$, where v is speed, F is tension in the string and m is mass.

(ii) Why do we find it useful to have two units for amount of substance, the kilogram and mole? Discuss briefly.

(iii) Name the three different conditions that could make $\vec{A_1}\times\vec{A_2}=0$.

(iv) Given that $\vec{A}=\hat{i}-2\hat{j}+3\hat{k}$ and $\vec{B}=3\hat{i}-4\hat{k}$. Find the projection of $\vec{A}$ on $\vec{B}$.

(v) Define momentum and impulse and find their relation.

(vi) Derive an expression for the range of a projectile.

(vii) Calculate the work done in Kilo Joules in lifting a mass of 20kg at steady velocity through a vertical height of $20m$.

(viii) Define Power with its unit and show that $P=\vec{F}\cdot\vec{V}$.

(ix) What is meant by moment of inertia? Discuss its significance briefly.

(x) Explain briefly the working of a carburettor of a motorcar using Bernoulli's principle.

SECTION – C (Marks 21)
(Chapters 7 to 11)

Q. 3 Answer any SEVEN parts. All parts carry equal marks. **(7 x3 = 21)**

(i) In relation to SHM explain briefly the equations:

a) $Y=A\sin(wt+\phi)$ b) $a=-w^2x$

(ii) A simple pendulum is $50cm$ long. What will be its frequency of vibration at a place where $g=9.8\ ms^{-2}$.

(iii) How are beats useful in tuning a musical instrument?

(iv) Why stars moving towards the earth show a blue shift and that are moving away show a red shift?

(v) Can visible light give interference fringes? Explain briefly.

(vi) Explain briefly whether the Young's Experiment is an experiment for studying interference or diffraction effect of light?

(vii) A magnifying glass gives five times enlarged image at $25cm$ from the lens. Find by ray diagram the focal length of the lens.

(viii) How is the power lost in optical fibre through dispersion? Explain briefly.

(ix) Specific heat of a gas at constant pressure is greater than the specific heat at constant volume. Why?

(x) What is the average translational K.E of molecules in a gas at $27\ ^{\circ}C$?

SECTION – D (Marks 26)

Note: Attempt any TWO questions. All questions carry equal marks. **(13 x 2 = 26)**

Q. 4 **a.** Define absolute gravitational P.E and derive its relation. **(1+5)**

b. What are non–conventional energy sources? Discus any two. **(1+3)**

c. How large a force is required to accelerate an electron ($m = 9.1 \times 10^{-31} kg$) from rest to speed of $2 \times 10^{7} ms^{-1}$ through $5cm$? **(03)**

Q. 5 **a.** Discuss SHM and uniform circular motion and derive an expression for displacement and acceleration in terms of w . **(06)**

b. Discuss energy conservation in SHM. **(04)**

c. What should be the length of simple pendulums whose period is 1sec at a place where $g = 9.8 ms^{-2}$. **(03)**

Q. 6 **a.** What is Carnot engine? Disuses its working and find out efficiency of Carnot engine. **(1+4+1)**

b. Show that the pressure exerted by gas is directly proportional to the average translational K.E of the gas molecules. **(04)**

c. $336J$ of energy is required to melt $1g$ of ice at $0\,°C$. What is the change in entropy of $30g$ of water at $0\,°C$ as it is changed to ice at $0\,°C$ by a refrigerator? **(03)**

—— 1HA 1808 (ON)——