

HOLIDAY HOMEWORK

Class-XI

Sub- Mathematics

1. Convert $40^\circ 20'$ into radian measure.
2. If $\cos x = -\frac{3}{5}$, x lies in the third quadrant, find the values of $\sin x$ and $\tan x$.
3. Express $(5 - 3i)^3$ in the form $a + ib$.
4. If $A = \{1, 2, 3, 4\}$ and $B = \{a, b, c, d\}$, find the total number of relations from A to B also write all the possible relation
5. Find the domain and range of the function $f(x) = \sqrt{(9 - x^2)}$.
6. Find the multiplicative inverse of $2 - 3i$.
7. If $x + iy = \frac{a+ib}{a-ib}$ then prove that $x^2 + y^2 = 1$.
8. Let $A = \{1, 2, 3, 4\}$ and $B = \{2, 4, 6, 8\}$. Define a relation R from A to B by $R = \{(x, y) : y = 2x\}$. Write R in roster form. Also find its domain and range.
9. Prove that $\cos 2x = \frac{1 - \tan^2 x}{1 + \tan^2 x}$
10. Prove that $\cot x \cot 2x - \cot 2x \cot 3x - \cot 3x \cot x = 1$
11. Write the set $\{2, 4, 6, 8, 10\}$ in set-builder form.
12. Determine whether the following sets are equal: $A = \{a, e, i, o, u\}$, $B = \{u, o, i, e, a\}$
13. If $A = \{x : x \text{ is a prime number less than } 10\}$, list the elements of A.
14. Let $A = \{1, 2, 3, 4, 5\}$ and $B = \{3, 4, 5, 6, 7\}$. Find: $A \cup B$
15. Define set with two examples.
16. Define finite and infinite set with proper example
17. Let $A = \{x : x \text{ is a factor of } 24\}$ and $B = \{x : x \text{ is a prime factor of } 24\}$. List the elements of A and B.
18. Write the set of all vowels in the English alphabet: in Roster Form and Set-Builder Form
19. Let $A = \{1, 2, 3, 4, 5\}$, $B = \{3, 4, 5, 6, 7\}$, find $A \cup B$ and $B \cap C$
20. Let $A = \{1, 2, 3, 4, 5\}$, $B = \{2, 4, 6, 8\}$, and $C = \{1, 3, 5, 7\}$. Find: $A \cap (B \cup C)$
21. If $A = \{1, 3, 5, 6, 7, 8, 9\}$, $B = \{x : x \text{ is an even natural number less than } 9\}$ then find $A \cup B$ and $A \cap B$
22. If $f(x) = 2x + 3$ and $g(x) = x^2$, find $(g \circ f)(x)$ and $(f \circ g)(x)$
23. If $\sin A = \frac{12}{13}$ and $\cos B = \frac{4}{5}$, find $\sin(A + B)$ and $\cos(A + B)$
24. Solve the inequality $3x - 7 < 2x + 5$ and represent the solution set on a number line
25. Expand $(x + 2)^5$ using the Binomial Theorem
26. A committee of 4 students is to be formed from 7 boys and 5 girls. Find the number of ways of forming the committee if it contains exactly 2 boys and 2 girls
27. If $A = \{1, 2, 3, 4, 5, 6\}$, $B = \{2, 4, 6, 8\}$ and $C = \{1, 2, 8, 9\}$, find $(A \cup B) \cap C$ and $(A \cap C) \cup (B \cap C)$. Verify that they are equal.
28. If $A = \{a, b, c\}$, then write all possible relations on A and find the total number of such relations.
29. Solve the inequality $3x - 7 > 2x + 5$. Express the solution in interval notation
30. How many five-digit numbers can be formed using the digits 0, 1, 2, 3, 4, 5 without repetition?
How many of these numbers are even?

EMRS KIRMIRA, JHARSUGUDA, ODISHA

HOMEWORK – CLASS XI

Subject: Physical Activity Trainer (PAT)

Chapters: Health and Hygiene; Props and Equipment

LONG ANSWER QUESTIONS

Chapter 1: Health and Hygiene

1. Define health and hygiene. Explain the importance of maintaining personal hygiene in daily life.
2. What is a balanced diet? Explain the importance of different nutrients in maintaining good health and physical fitness.
3. Explain the importance of personal hygiene, environmental hygiene, and food hygiene.
4. What are communicable and non-communicable diseases? Explain their causes and preventive measures with suitable examples.
5. What is first aid? Explain its importance and describe the basic principles of providing first aid during an emergency.

Chapter 2: Props and Equipment

6. What are props and sports equipment? Explain their importance in physical education and sports training with suitable examples.
7. Describe the different types of props and equipment used in physical activities and explain their uses.
8. Explain the safety precautions that should be followed while using sports equipment during physical activities.
9. Describe the proper methods of cleaning, maintaining, and storing sports equipment to ensure its durability and safety.
10. What factors should be considered while selecting sports equipment for school students? Explain with suitable examples.

Instructions: Attempt all 10 questions. Write each answer in approximately 150–200 words. Use suitable examples wherever necessary.

CLASS XI – ENGLISH QUESTION PAPER

SECTION A: HORNBILL

1. Portrait of a Lady: Describe the relationship between the author and his grandmother. How did their relationship change over time?
2. A Photograph: How does the poet express her feelings of loss and the passage of time in the poem A Photograph?
3. We're Not Afraid to Die... if We Can All Be Together: How did the family members show courage and determination during the dangerous sea voyage?
4. The Laburnum Top: How does the arrival of the goldfinch bring life and activity to the laburnum tree?
5. The Voice of the Rain: How does the rain describe its journey from the earth to the sky and back to the earth?

SECTION B: SNAPSHOTS

6. The Summer of the Beautiful White Horse: Why did Aram find it difficult to believe that Mourad had stolen the horse?
7. The Address: Why did the narrator decide to forget the address and move on from her painful memories?

SECTION C: WRITING SKILLS

8. You are the Cultural Secretary of your school. Write a notice informing students about an inter-house debate competition to be held in your school. Mention the date, time, venue, and last date for registration.
9. You are a student of Class XI. Prepare a speech on "The Importance of Environmental Protection" to be delivered during the morning assembly of your school.

दशहरा अवकाश गृहकार्य

कक्षा – 11वीं

विषय – हिंदी कोर (Hindi Core)

सत्र – 2026–27

विद्यार्थियों के लिए आवश्यक निर्देश:

*:सभी प्रश्नों के उत्तर हिंदी की कॉपी में साफ-सुथरी लिखावट में लिखें।

*गृहकार्य निर्धारित समय में पूरा करें।

*प्रत्येक प्रश्न का उत्तर स्वयं लिखने का प्रयास करें।

* गृहकार्य विद्यालय खुलने पर जमा करना अनिवार्य है।



खंड – क : आरोह भाग-1

प्रश्न 1. निम्नलिखित प्रश्नों के उत्तर लिखिए।

2. कबीर की साखियों में निहित मुख्य संदेश को स्पष्ट कीजिए।

3. मीरा के पदों में व्यक्त भक्ति-भावना का वर्णन कीजिए।

4. 'घर की याद' कविता का केंद्रीय भाव अपने शब्दों में लिखिए।

5. 'चंपा काले-काले अच्छर नहीं चीन्हती' कविता के माध्यम से कवि क्या संदेश देना चाहता है?

6. 'गज़ल' के आधार पर सामाजिक व्यवस्था की विसंगतियों को स्पष्ट कीजिए।



खंड – ख : वितान भाग-1

प्रश्न 2. निम्नलिखित प्रश्नों के उत्तर दीजिए।

1. 'भारतीय गायिकाओं में बेजोड़ : लता मंगेशकर' पाठ की प्रमुख विशेषताएँ लिखिए।

2. 'राजस्थान की रजत बूँदें' पाठ में जल-संरक्षण का क्या महत्व बताया गया है?

3. 'आलो-आँधरि' पाठ की लेखिका के संघर्षों का वर्णन कीजिए।



खंड – ग : लेखन कौशल

प्रश्न 3. निम्नलिखित में से किन्हीं दो विषयों पर लगभग 150–200 शब्दों में अनुच्छेद लिखिए।

1. दशहरा पर्व का महत्व

2. पर्यावरण संरक्षण

3. विद्यार्थी जीवन में अनुशासन

4. मोबाइल फोन के लाभ और हानियाँ

प्रश्न 4. पत्र लेखन

निम्नलिखित में से किसी एक विषय पर पत्र लिखिए।

अपने विद्यालय के प्रधानाचार्य को पुस्तकालय में हिंदी की नई पुस्तकें उपलब्ध कराने हेतु आवेदन-पत्र लिखिए।

अपने मित्र को दशहरा पर्व की शुभकामनाएँ देते हुए पत्र लिखिए।

प्रश्न 5. रचनात्मक लेखन

दशहरा पर्व पर एक आकर्षक विज्ञापन तैयार कीजिए।

'बुराई पर अच्छाई की विजय' विषय पर एक लघु कहानी लिखिए।



खंड – घ : व्याकरण

प्रश्न 6. निम्नलिखित कार्य कीजिए।

1. संचार के विभिन्न माध्यमों के नाम लिखिए।

2. जनसंचार माध्यमों का महत्व स्पष्ट कीजिए।

3. औपचारिक और अनौपचारिक पत्र में अंतर लिखिए।

4. अभिधा, लक्षणा और व्यंजना शब्द-शक्तियों की परिभाषा उदाहरण सहित लिखिए।

EMRS KIRMIRA
AUTUMN HOLIDAY HOMEWORK-2026-2027
SUBJECT-COMPUTERB SCIENCE
CLASS-11 SCIENCE

1. What is the function of the motherboard?
2. Convert $(101101)_2$ into decimal.
3. Convert $(45)_{10}$ into binary.
4. Convert $(157)_8$ into decimal.
5. Convert $(2F)_{16}$ into decimal.
6. Convert $(110101)_2$ into octal.
7. Convert $(255)_{10}$ into hexadecimal.
8. Differentiate between computer organization and computer architecture.
9. Draw and explain the block diagram of a computer.
10. What are universal gates?
11. Why are NAND and NOR called universal gates?
12. Draw the truth tables of NAND and NOR gates.
13. Explain XOR gate with its truth table.
14. What are the advantages of a flowchart?
15. What are the disadvantages of a flowchart?
16. Draw and explain the common symbols used in a flowchart.
17. Differentiate between an algorithm and a flowchart.
18. Draw a flowchart to calculate the area of a circle.
19. Explain the importance of flowcharts in problem-solving.
20. Write problem Problem solving steps.

CLASS 11 BIOLOGY: HOMEWORK ASSIGNMENT

Coverage: Chapter 1 to Chapter 10 (Cell Cycle and Cell Division)

SECTION A: VERY SHORT ANSWER QUESTIONS (1 Mark Each)

- 1. What is the basic unit of classification in taxonomy?
- 2. Define the term metabolism. Is it a defining feature of living organisms?
- 3. Name the main photosynthetic pigments present in Rhodophyceae (Red Algae).
- 4. Which cell organelle is known as the 'protein factory' of the cell?
- 5. State the main function of the Golgi apparatus.
- 6. In which sub-stage of Prophase I does synapsis take place?
- 7. What is the G₀ phase (quiescent stage) of the cell cycle?

SECTION B: SHORT ANSWER QUESTIONS (2 - 3 Marks Each)

- 1. **The Living World:** Differentiate between growth in living organisms and growth in non-living objects with suitable examples.
- 2. **Biological Classification:** Write three key structural and staining differences between Gram-positive and Gram-negative bacteria.
- 3. **Plant Kingdom:** Compare Bryophytes and Pteridophytes on the basis of dominant plant body phase and presence of vascular tissues.
- 4. **Animal Kingdom:** List two characteristic features of Phylum Arthropoda and differentiate between diploblastic and triploblastic animals.
- 5. **Cell Unit of Life:** Describe the structural features and arrangement of lipid bilayer and proteins in the Fluid Mosaic Model of the plasma membrane.
- 6. **Biomolecules:** Differentiate between primary and secondary metabolites with examples. Explain how enzymes lower activation energy.
- 7. **Cell Cycle & Cell Division:** Explain the cellular events occurring during the S-phase of Interphase. Differentiate between Mitosis and Meiosis.

SECTION C: ASSERTION & REASON QUESTIONS

INSTRUCTIONS

Directions for Questions 1 to 3:

- (A) Both Assertion and Reason are true, and Reason is the correct explanation of Assertion.
- (B) Both Assertion and Reason are true, but Reason is NOT the correct explanation of Assertion.
- (C) Assertion is true, but Reason is false.
- (D) Assertion is false, but Reason is true.

Q1. Assertion: Meiosis produces four genetically diverse haploid daughter cells.

Reason: Crossing over and independent assortment occur during Meiosis I.

Q2. Assertion: Lysosomes are known as the suicidal bags of the cell.

Reason: Lysosomes contain hydrolytic enzymes capable of digesting cellular components.

Q3. Assertion: Mitosis occurs only in diploid somatic cells of animals.

Reason: Mitosis maintains a constant chromosome number across cell divisions.

SECTION D: LONG ANSWER QUESTIONS (5 Marks Each)

- **1. Cell Division:** Describe the sub-stages of Prophase I of Meiosis I in detail (Leptotene, Zygotene, Pachytene, Diplotene, Diakinesis). Include relevant schematic diagrams illustrating chromosomal behavior.
- **2. Cell Structure:** Compare the ultrastructure of a Prokaryotic cell and a Eukaryotic cell. Highlight differences in nuclear material, membrane-bound organelles, and ribosomal types.
- **3. Plant Morphology & Anatomy:** Explain the internal anatomy (T.S.) of a Dicot stem versus a Monocot stem with well-labeled structural descriptions and tissue arrangements.

SECTION E: RECOMMENDED DIAGRAM PRACTICE

Practice drawing and labeling the following key diagrams in your notebook:

- • Taxonomic Hierarchy pyramid.
- • Transverse section (T.S.) of Dicot Stem and Monocot Stem.
- • Ultrastructure of Plant Cell and Animal Cell.
- • Fluid Mosaic Model of Plasma Membrane.
- • Stages of Mitosis (Prophase, Metaphase, Anaphase, Telophase).
- • Stages of Meiosis I (Prophase I sub-stages).

EMRS KIRMIRA

Holiday Homework – Session 2026–27

Class: XI Science**Subject: Chemistry****Maximum Marks: 50****Name:** _____**Roll No.:** _____**General Instructions**

1. All questions are compulsory.
2. Read each question carefully and show calculations wherever required.
3. Write neat, stepwise solutions, chemical equations, and derivations wherever necessary.
4. Use appropriate units and significant figures in numerical answers.

Section A: Structure of Atom**(15 Marks)**

1. [1 Mark] Calculate the total number of electrons present in 1.4 g of dinitrogen gas, N_2 . (*Atomic number of N = 7; Avogadro constant = $6.022 \times 10^{23} \text{ mol}^{-1}$*).
2. [2 Marks] A 100 W bulb emits monochromatic light of wavelength 400 nm. Calculate the number of photons emitted per second. Take $h = 6.626 \times 10^{-34} \text{ J s}$ and $c = 3.0 \times 10^8 \text{ m s}^{-1}$. Assume all the electrical power is emitted as light of this wavelength.
3. [3 Marks] State Heisenberg's Uncertainty Principle. Calculate the uncertainty in velocity of a cricket ball of mass 150 g if the uncertainty in its position is 1 Å. Take $h = 6.626 \times 10^{-34} \text{ J s}$.
4. [2 Marks] Calculate the de Broglie wavelength of an electron moving with a velocity of $2.0 \times 10^6 \text{ m s}^{-1}$. Take $h = 6.626 \times 10^{-34} \text{ J s}$ and electron mass $m_e = 9.1 \times 10^{-31} \text{ kg}$.
5. [2 Marks] Calculate the frequency and energy of a photon having wavelength 500 nm. Use $h = 6.626 \times 10^{-34} \text{ J s}$ and $c = 3.0 \times 10^8 \text{ m s}^{-1}$.
6. [2 Marks] Write the electronic configurations of Cr ($Z = 24$) and Cu ($Z = 29$). Explain briefly why their configurations differ from the expected configurations.
7. [3 Marks] For a hydrogen atom, calculate the energy of an electron in the $n = 3$ orbit and the energy required to excite it from $n = 1$ to $n = 3$. Use $E_n = -2.18 \times 10^{-18} / n^2 \text{ J}$.

Section B: Classification of Elements and Periodicity**(15 Marks)**

8. [1 Mark] Write the general electronic configuration of d-block elements and identify the period to which the element with atomic number 33 belongs.
9. [2 Marks] Explain why the electron gain enthalpy of chlorine is more negative than that of fluorine, although fluorine has a smaller atomic size.
10. [2 Marks] Arrange the following in increasing order:
 - (a) F, Cl, Br, I in terms of magnitude of negative electron gain enthalpy.
 - (b) Na^+ , Mg^{2+} , Al^{3+} , F^- in terms of ionic radius.
11. [2 Marks] Define ionisation enthalpy. Why does the first ionisation enthalpy generally increase across a period from left to right?

12. [2 Marks] Explain why the atomic radius decreases across a period but generally increases down a group.
13. [2 Marks] An element has atomic number 17. Identify its group and period, write its valence-shell electronic configuration, and predict whether it is a metal or a non-metal.
14. [2 Marks] Which is expected to have the higher first ionisation enthalpy in each pair? Give a reason:
- (a) Be or B
- (b) N or O
15. [2 Marks] Define electronegativity. State its general trend across a period and down a group.

Section C: Chemical Bonding and Molecular Structure (20 Marks)

15. [2 Marks] Using VSEPR theory, predict the electron-pair geometry and molecular shape of SF_4 and ClF_3 .
16. [2 Marks] CO_2 and H_2O are both triatomic molecules. The dipole moment of CO_2 is zero, whereas that of H_2O is 1.85 D. Explain this difference on the basis of their molecular geometries.
17. [2 Marks] Define hybridisation. State the hybridisation of carbon atoms in acetylene, C_2H_2 , and the bond angle around each carbon atom.
18. [3 Marks] Write the molecular orbital electronic configuration of O_2 . Calculate its bond order and explain its magnetic behaviour.
19. [2 Marks] Draw the Lewis structures of NH_3 and H_2O . State the number of lone pairs on the central atom in each molecule.
20. [2 Marks] Explain the formation of an ionic bond in NaCl using electron transfer. Write the electronic configurations of the resulting ions.
21. [2 Marks] Distinguish between sigma (σ) and pi (π) bonds on the basis of orbital overlap and relative strength.
22. [2 Marks] Predict the shapes of BeCl_2 and BF_3 using VSEPR theory. State the bond angles in each molecule.
23. [2 Marks] What is resonance? Explain it with reference to the carbonate ion, CO_3^{2-} .
24. [3 Marks] Using molecular orbital theory, calculate the bond order of N_2 and N_2^+ . Which species has the stronger bond, and why?

Submitted By: _____

Teacher's Sign: _____

Roll No.: _____

EKLAVYA MODEL RESIDENTIAL SCHOOL, KIRMIRA

AUTUMN BREAK HOLIDAY HOMEWORK

CLASS XI – PHYSICS

Name: _____

Roll No.: _____

Academic Session: 2026–27**Total Questions:** 120

Syllabus covered: Units and Measurements; Motion in a Straight Line; Motion in a Plane (including uniform circular motion); Laws of Motion (including friction); Work, Energy and Power; System of Particles and Rotational Motion; Gravitation.

Instructions

1. Attempt all 120 questions in a separate, neat Physics notebook.
2. Each question carries 2 or 3 marks. The homework is numerical and competency-focused; show complete working.
3. Write the relevant formula first, substitute values with SI units, and clearly state the final answer with units.
4. Draw a free-body diagram wherever forces or friction are involved. Use suitable diagrams for projectile motion, circular motion, torque and gravitation where helpful.
5. Unless stated otherwise, take $g = 9.8 \text{ m s}^{-2}$ near Earth's surface. Use the value of g specified in an individual question when given.
6. Assume ideal strings and pulleys, negligible air resistance, and smooth surfaces only where explicitly stated.
7. Complete the work independently and submit it on the date announced by the school.

Level: Standard — Marks per question: 2–3

Unit 1: Units and Measurements

1. **(2 marks)** The length and breadth of a rectangular sheet are measured as $(12.4 \pm 0.1) \text{ cm}$ and $(8.2 \pm 0.1) \text{ cm}$. Estimate the maximum absolute error in its area.
2. **(2 marks)** A vernier calipers has 10 divisions on its vernier scale equal to 9 main-scale divisions. If one main-scale division is 1 mm, find its least count.
3. **(2 marks)** A screw gauge has pitch 0.5 mm and 50 circular-scale divisions. Its main-scale reading is 4.5 mm and circular-scale reading is 32. Find the measured diameter, ignoring zero error.
4. **(3 marks)** The measured values of a length are 5.2, 5.4, 5.3, 5.5 and 5.1 cm. Calculate the mean absolute error and express the result suitably.
5. **(2 marks)** A physical quantity is given by $Q = \frac{a^2 b^3}{\sqrt{c}}$. If the percentage errors in a, b, c are 1%, 2%, 4%, find the maximum percentage error in Q .
6. **(3 marks)** Using dimensional analysis, test whether the relation $v^2 = u^2 + 2as$ is dimensionally consistent. State one limitation of dimensional analysis.
7. **(2 marks)** The frequency f of a stretched string depends on its length L , tension T and mass per unit length μ . Assume $f \propto L^a T^b \mu^c$. Find a, b, c using dimensional analysis.
8. **(3 marks)** A cuboid has dimensions $(2.50 \pm 0.02) \text{ cm}$, $(1.20 \pm 0.01) \text{ cm}$ and $(0.80 \pm 0.01) \text{ cm}$. Calculate its volume and maximum percentage error.

9. (2 marks) Convert 72 km h^{-1} into m s^{-1} and express the result in scientific notation.
10. (2 marks) The radius of a sphere is measured as 2.10 cm . Calculate its volume with the appropriate number of significant figures.
11. (3 marks) A quantity is calculated from $P = \frac{F}{A}$. If force is measured as $(20.0 \pm 0.5) \text{ N}$ and area as $(4.0 \pm 0.1) \text{ m}^2$, find P and its maximum percentage error.
12. (2 marks) Check dimensionally whether $s = ut + \frac{1}{2}at^2$ is valid, where the symbols have their usual meanings.
13. (3 marks) The period of a simple pendulum is proposed to depend on its length l and gravitational acceleration g . Use dimensional analysis to obtain the possible form of the relation.
14. (2 marks) A student records a mass as 0.004560 kg . How many significant figures does the value contain? Write it in scientific notation without changing its precision.
15. (3 marks) The density of a metal is found using $\rho = m/V$. If the percentage errors in mass and radius of a spherical sample are 1.5% and 1% , respectively, estimate the maximum percentage error in density.
16. (2 marks) A stopwatch measures a time interval as 2.35 s with an uncertainty of 0.01 s . Find the relative error and percentage error.

Unit 2: Motion in a Straight Line

17. (2 marks) A car starts from rest and accelerates uniformly at 2.0 m s^{-2} for 8 s . Find its final speed and distance travelled.
18. (3 marks) A train moving at 20 m s^{-1} is brought to rest with uniform retardation in 10 s . Find the retardation and stopping distance.
19. (2 marks) A particle moves along a straight line with initial velocity 5 m s^{-1} and acceleration -2 m s^{-2} . Find the time at which it momentarily stops and its displacement by then.
20. (3 marks) A body covers 12 m in the first 2 s and 20 m in the next 2 s under uniform acceleration. Find its initial velocity and acceleration.
21. (2 marks) The position of a particle is $x = 4 + 3t - 2t^2$ (SI units). Find its velocity and acceleration at $t = 2 \text{ s}$.
22. (3 marks) A ball is thrown vertically upward with speed 24 m s^{-1} . Taking $g = 9.8 \text{ m s}^{-2}$, calculate the time to reach maximum height and the maximum height.
23. (2 marks) A cyclist increases speed uniformly from 4 m s^{-1} to 10 m s^{-1} over 21 m . Find the acceleration.
24. (3 marks) A vehicle travelling at 25 m s^{-1} takes 5 s to react before braking. It then decelerates at 5 m s^{-2} . Find the total stopping distance.
25. (2 marks) A particle's velocity changes uniformly from -6 m s^{-1} to $+10 \text{ m s}^{-1}$ in 4 s . Find its acceleration and displacement in this interval.
26. (3 marks) A stone is dropped from the top of a tower and reaches the ground in 3 s . Neglecting air resistance, find the tower's height and the speed just before impact. Take $g = 9.8 \text{ m s}^{-2}$.
27. (2 marks) The position-time graph of a particle is a straight line from $(t, x) = (0, 5 \text{ m})$ to $(4 \text{ s}, -7 \text{ m})$. Find its velocity and the time at which it passes the origin.

28. (3 marks) A bus moving at 12 m s^{-1} accelerates at 1.5 m s^{-2} for 6 s, then moves at constant speed for 10 s. Find the total distance travelled.
29. (2 marks) A body moving at 18 m s^{-1} is uniformly retarded at 3 m s^{-2} . Find the distance covered in the last 2 s before it stops.
30. (3 marks) A particle has velocity $v = 6 - 2t$ in SI units. Calculate its displacement from $t = 0$ to $t = 5 \text{ s}$ and the total distance travelled in that interval.
31. (2 marks) A car travels the first half of a journey at 30 km h^{-1} and the second half at 60 km h^{-1} . Find its average speed for the entire journey.
32. (3 marks) A ball is thrown vertically upward from a platform 20 m above the ground with speed 10 m s^{-1} . Find the time taken to reach the ground. Take $g = 10 \text{ m s}^{-2}$.

Unit 3: Motion in a Plane

33. (2 marks) Two perpendicular displacements of 6 m east and 8 m north act on a particle. Find the magnitude and direction of the resultant displacement.
34. (3 marks) A projectile is launched at 20 m s^{-1} at an angle of 30° above the horizontal. Find the time of flight, maximum height and horizontal range. Take $g = 10 \text{ m s}^{-2}$.
35. (2 marks) A ball is projected horizontally at 15 m s^{-1} from a cliff 45 m high. Find the time to reach the ground and the horizontal distance travelled. Take $g = 10 \text{ m s}^{-2}$.
36. (3 marks) A projectile has a range of 80 m when projected at 45° on level ground. Find its initial speed, taking $g = 10 \text{ m s}^{-2}$.
37. (2 marks) A projectile is fired with speed 25 m s^{-1} at 37° above horizontal. Using $\sin 37^\circ = 0.6$ and $\cos 37^\circ = 0.8$, find its horizontal and vertical velocity components.
38. (3 marks) A ball is thrown at 20 m s^{-1} at 60° to the horizontal. Find its velocity components after 1 s and the magnitude of its velocity then. Take $g = 10 \text{ m s}^{-2}$.
39. (2 marks) A particle moves in a circle of radius 2 m at a constant speed of 6 m s^{-1} . Find its centripetal acceleration.
40. (3 marks) A car rounds a circular bend of radius 50 m at 15 m s^{-1} . Calculate its centripetal acceleration and state the direction of the required net force.
41. (2 marks) A stone tied to a string moves in a horizontal circle of radius 0.8 m and completes 5 revolutions in 10 s. Find its frequency, period and angular speed.
42. (3 marks) A particle moves uniformly in a circle of radius 0.5 m with angular speed 8 rad s^{-1} . Find its linear speed and centripetal acceleration.
43. (2 marks) A projectile is launched at 30 m s^{-1} at 30° above horizontal. Find the time at which it reaches its highest point. Take $g = 10 \text{ m s}^{-2}$.
44. (3 marks) A ball is projected from ground level at 20 m s^{-1} at 30° . Find the two times at which it is 5 m above the launch point. Take $g = 10 \text{ m s}^{-2}$.
45. (2 marks) A rotating wheel has radius 0.35 m and rotates at 120 revolutions per minute. Calculate the angular speed and the linear speed of a point on its rim.
46. (3 marks) A particle moves on a circular track of radius 14 m at a constant speed of 7 m s^{-1} . Find the time taken for one revolution and the magnitude of its acceleration.

47. (2 marks) A projectile has horizontal and vertical initial velocity components of 12 m s^{-1} and 16 m s^{-1} . Find its initial speed and angle of projection.
48. (3 marks) A plane flies horizontally at 100 m s^{-1} and releases a package from a height of 500 m. Neglecting air resistance, find the time of fall and horizontal distance travelled by the package. Take $g = 10 \text{ m s}^{-2}$.
49. (2 marks) A particle completes a quarter of a circle of radius 4 m. Find the magnitude of its displacement and the distance travelled.

Unit 4: Laws of Motion (including friction)

50. (2 marks) A net force of 18 N acts on a body of mass 6 kg. Find its acceleration. What acceleration would the same force produce if the mass were doubled?
51. (3 marks) A 5 kg block on a smooth horizontal surface is pulled by a horizontal force of 20 N. Find its acceleration and the distance covered in 3 s from rest.
52. (2 marks) A 10 kg body is pulled horizontally by 40 N on a frictionless surface. Find the normal reaction and acceleration. Take $g = 10 \text{ m s}^{-2}$.
53. (3 marks) A 4 kg block is pulled by a 20 N horizontal force on a rough floor. If the coefficient of kinetic friction is 0.25, find the frictional force and acceleration. Take $g = 10 \text{ m s}^{-2}$.
54. (3 marks) A 5 kg block rests on a horizontal surface with coefficient of static friction 0.4. Find the maximum static friction. Will a horizontal force of 15 N move the block? Take $g = 10 \text{ m s}^{-2}$.
55. (2 marks) A 2 kg block slides on a horizontal floor with coefficient of kinetic friction 0.3. Find the magnitude of its deceleration after the pushing force is removed. Take $g = 10 \text{ m s}^{-2}$.
56. (3 marks) A 6 kg block is pulled along a horizontal surface by a 30 N force inclined at 37° above horizontal. If $\mu_k = 0.2$, calculate the normal reaction and acceleration. Use $\sin 37^\circ = 0.6$, $\cos 37^\circ = 0.8$, and $g = 10 \text{ m s}^{-2}$.
57. (3 marks) A 4 kg block is pushed horizontally against a vertical wall with a force of 100 N. If the coefficient of static friction is 0.5, determine whether friction can prevent it from sliding down. Take $g = 10 \text{ m s}^{-2}$.
58. (2 marks) A 1,200 kg car accelerates at 2 m s^{-2} on a level road. Find the net force acting on it.
59. (3 marks) Two blocks of masses 3 kg and 2 kg are connected by a light string on a smooth horizontal table. A horizontal force of 20 N pulls the 3 kg block. Find the acceleration and tension in the string.
60. (3 marks) A 4 kg block on a smooth table is connected over a light pulley to a hanging 2 kg block. Find the acceleration of the system and the string tension. Take $g = 10 \text{ m s}^{-2}$.
61. (2 marks) A 60 kg person stands on a weighing scale in a lift accelerating upward at 2 m s^{-2} . Find the scale reading in newtons. Take $g = 10 \text{ m s}^{-2}$.
62. (2 marks) A 50 kg person stands on a scale in a lift accelerating downward at 3 m s^{-2} . Find the apparent weight. Take $g = 10 \text{ m s}^{-2}$.
63. (3 marks) A 10 kg block is on a 30° rough incline with $\mu_k = 0.2$. Determine the acceleration as it slides down the plane. Take $g = 10 \text{ m s}^{-2}$, $\sin 30^\circ = 0.5$, $\cos 30^\circ = 0.866$.
64. (3 marks) A 2 kg block is pressed against a vertical wall by a horizontal force of 50 N. If $\mu_s = 0.5$, calculate the maximum frictional force and decide whether the block remains at rest. Take $g = 10 \text{ m s}^{-2}$.
65. (2 marks) A force of 25 N is required to just start moving a 10 kg crate on a horizontal floor. Estimate the coefficient of static friction. Take $g = 10 \text{ m s}^{-2}$.

66. (3 marks) A 5 kg block is acted upon by 30 N to the right and 10 N to the left on a smooth surface. Find its acceleration and its speed after 4 s if it starts from rest.
67. (3 marks) A 2 kg object moving at 8 m s^{-1} is stopped uniformly in 4 s by a horizontal force. Find the magnitude of the retarding force and the impulse delivered.

Unit 5: Work, Energy and Power

68. (2 marks) A constant force of 25 N moves a box 4 m in the direction of the force. Calculate the work done.
69. (2 marks) A force of 50 N acts at 60° to the displacement of 8 m. Find the work done by the force.
70. (3 marks) A 2 kg object initially at rest is acted upon by a constant net force of 10 N over 5 m. Use the work-energy theorem to find its final speed.
71. (2 marks) A 1,000 kg car increases its speed from 10 m s^{-1} to 20 m s^{-1} . Calculate the change in kinetic energy.
72. (3 marks) A 2 kg stone is dropped from a height of 20 m. Neglecting air resistance, find its speed just before hitting the ground using conservation of mechanical energy. Take $g = 10 \text{ m s}^{-2}$.
73. (2 marks) A 5 kg object is raised vertically through 3 m at constant speed. Find the work done against gravity. Take $g = 10 \text{ m s}^{-2}$.
74. (3 marks) A spring of force constant 200 N m^{-1} is compressed by 0.10 m. Calculate the elastic potential energy stored.
75. (2 marks) A motor lifts a 100 kg load through 5 m in 10 s. Find the useful power output. Take $g = 10 \text{ m s}^{-2}$.
76. (3 marks) A 1,200 kg car moving at 15 m s^{-1} is stopped by brakes. Calculate the work done by the braking force.
77. (2 marks) A body of mass 4 kg has kinetic energy 200 J. Find its speed.
78. (3 marks) A 20 kg trolley moving at 3 m s^{-1} is brought to rest by friction over 5 m. Find the work done by friction and the average frictional force.
79. (2 marks) A force varies with position as $F = 4x \text{ N}$ along the x-axis. Calculate the work done from $x = 0$ to $x = 3 \text{ m}$.
80. (3 marks) A 2 kg block slides from rest down a smooth track through a vertical height of 5 m. Find its speed at the bottom and explain which energy transformation occurs. Take $g = 10 \text{ m s}^{-2}$.
81. (2 marks) A pump raises 500 kg of water by 8 m in 20 s. Find its output power. Take $g = 10 \text{ m s}^{-2}$.
82. (3 marks) A ball is thrown vertically upward with speed 20 m s^{-1} . Use energy conservation to calculate its maximum height. Take $g = 10 \text{ m s}^{-2}$.
83. (3 marks) A 4 kg block moving at 5 m s^{-1} compresses a spring of force constant 500 N m^{-1} on a smooth surface. Find the maximum compression.
84. (2 marks) A machine receives 800 J of energy and delivers 600 J of useful work. Calculate its efficiency.
85. (3 marks) A 2 kg body moves under a conservative force from point A, where its speed is 6 m s^{-1} , to point B, where its speed is 2 m s^{-1} . Find the change in kinetic energy and the work done by the net force.

Unit 6: System of Particles and Rotational Motion

86. (2 marks) Two particles of masses 2 kg and 6 kg are located at $x = 0$ m and $x = 4$ m. Find the x-coordinate of their centre of mass.
87. (3 marks) Three particles of masses 1 kg, 2 kg and 3 kg are located at (0,0), (2,0) and (0,4) m. Find the coordinates of the centre of mass.
88. (2 marks) A 4 kg particle at $x = 2$ m and a 6 kg particle at $x = 7$ m form a system. Find the centre of mass and state how its position changes if both masses are doubled.
89. (3 marks) A 50 kg person stands at one end of a 4 m long, 20 kg uniform plank. Find the centre of mass of the person-plank system measured from that end, treating the person as a point mass.
90. (2 marks) A 0.2 kg ball moving east at 10 m s^{-1} collides with a stationary 0.3 kg ball. If they stick together, find their common velocity after collision.
91. (3 marks) A 2 kg trolley moving at 4 m s^{-1} collides and sticks to a 3 kg trolley moving in the opposite direction at 2 m s^{-1} . Find the final velocity, taking the first trolley's direction as positive.
92. (2 marks) A force of 15 N acts perpendicular to a spanner 0.20 m from a nut. Calculate the magnitude of the torque.
93. (3 marks) A 40 N force acts at 30° to a wrench of length 0.5 m. Find the torque about the pivot if the force is applied at the end.
94. (2 marks) A uniform metre rule is balanced at its 50 cm mark. A 2 N weight is hung at the 20 cm mark. Where should a 3 N weight be hung on the other side to balance it?
95. (3 marks) A solid disc of mass 4 kg and radius 0.5 m rotates about its central axis. Using $I = \frac{1}{2}MR^2$, calculate its moment of inertia.
96. (2 marks) A wheel has moment of inertia 2 kg m^2 and angular speed 5 rad s^{-1} . Find its rotational kinetic energy.
97. (3 marks) A constant torque of 6 N m acts on a body with moment of inertia 3 kg m^2 . Find its angular acceleration and angular speed after 4 s from rest.
98. (2 marks) A particle of mass 0.5 kg moves at 8 m s^{-1} in a circle of radius 2 m. Find its angular momentum about the centre.
99. (3 marks) A 2 kg particle is at position $\vec{r} = (3\hat{i} + 2\hat{j})$ m and experiences force $\vec{F} = 4\hat{j}$ N. Calculate the torque about the origin.
100. (2 marks) A 1 kg particle moving at 6 m s^{-1} has its speed doubled. By what factor does its kinetic energy change?
101. (3 marks) A uniform rod of mass 3 kg and length 2 m rotates about an axis through its centre and perpendicular to its length. Using $I = ML^2/12$, calculate its moment of inertia.
102. (2 marks) A rotating body has angular speed 10 rad s^{-1} . If its angular speed becomes 20 rad s^{-1} with moment of inertia unchanged, compare its rotational kinetic energies.

Unit 7: Gravitation

103. (2 marks) Two point masses of 5 kg and 10 kg are separated by 2 m. Calculate the gravitational force between them. Take $G = 6.67 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$.
104. (3 marks) Calculate the acceleration due to gravity at the surface of a planet of mass 6×10^{24} kg and radius 6.4×10^6 m. Use $G = 6.67 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$.

- 105. (2 marks)** If the radius of a planet remains unchanged but its mass becomes four times, how does the surface gravitational acceleration change? Explain using a formula.
- 106. (3 marks)** The radius of Earth is R . Find the acceleration due to gravity at a height equal to R above the surface in terms of g at the surface.
- 107. (2 marks)** Calculate the weight of a 60 kg astronaut on a planet where $g = 3.7 \text{ m s}^{-2}$. Compare it with the astronaut's weight on Earth, taking $g = 9.8 \text{ m s}^{-2}$.
- 108. (3 marks)** A satellite orbits Earth at a height of $3R$ above the surface, where R is Earth's radius. Express the gravitational acceleration at that height in terms of surface value g .
- 109. (2 marks)** Find the gravitational potential energy of two masses 2 kg and 3 kg separated by 0.5 m, taking zero potential energy at infinite separation.
- 110. (3 marks)** Derive the expression for escape speed from the surface of a planet of mass M and radius R , and calculate it for a planet with $g = 10 \text{ m s}^{-2}$ and $R = 6.4 \times 10^6 \text{ m}$.
- 111. (2 marks)** A satellite moves in a circular orbit of radius $7.0 \times 10^6 \text{ m}$ around Earth. If Earth's gravitational parameter $GM = 4.0 \times 10^{14} \text{ m}^3 \text{ s}^{-2}$, find its orbital speed.
- 112. (3 marks)** Using $GM = 4.0 \times 10^{14} \text{ m}^3 \text{ s}^{-2}$, calculate the orbital period of a satellite in a circular orbit of radius $7.0 \times 10^6 \text{ m}$.
- 113. (2 marks)** Why does an astronaut in an orbiting satellite experience apparent weightlessness even though Earth's gravity is acting on the satellite?
- 114. (3 marks)** A planet has twice Earth's mass and twice Earth's radius. Find its surface gravitational acceleration in terms of g on Earth and its escape speed in terms of Earth's escape speed.
- 115. (2 marks)** At what distance from Earth's centre is the gravitational acceleration equal to $g/4$, assuming the point is outside Earth? Express your answer in terms of Earth's radius R .
- 116. (3 marks)** A body is taken from Earth's surface to a height equal to Earth's radius. Calculate the change in gravitational potential energy for a body of mass m , in terms of GMm/R .
- 117. (2 marks)** A satellite is shifted from a circular orbit of radius r to another circular orbit of radius $4r$. Compare its orbital speed in the two orbits.
- 118. (3 marks)** A planet has a moon orbiting it with orbital radius r and period T . If another satellite orbits at radius $9r$, find its orbital period in terms of T , using Kepler's third law.
- 119. (2 marks)** A 1 kg object is released from rest at a height of $2R$ above a planet's surface. Express its initial gravitational potential energy relative to infinity in terms of GM/R .
- 120. (3 marks)** The period of a planet around a star is 8 years when its orbital radius is 4 astronomical units. Estimate the period of another planet orbiting the same star at 9 astronomical units using Kepler's third law.

End of Holiday Homework

Practise carefully, show your reasoning, and check units in every numerical answer.

Holiday homework for autumn break (Odia) Class -XI

୧. ଝାରସୁଗୁଡ଼ା ଜିଲ୍ଲାର ଇତିହାସ – ରଚନା
୨. ହଳଧର ନାଗଙ୍କ ଜୀବନୀ ଓ କୃତି – ରଚନା
୩. ମୃତ୍ତିକା ସଂରକ୍ଷଣ – ରଚନା
୪. ଦଶହରା - ରଚନା
୫. ଭାଲୁ ଉପଦ୍ରବ – ପ୍ରଶ୍ନୋତ୍ତର
୬. ହିମକାଳ – ପ୍ରଶ୍ନୋତ୍ତର
୭. ମଧୁବାବୁ – ପ୍ରଶ୍ନୋତ୍ତର