PHYSICS EDUCATION
New Syllabus

Level: Class XI

Full Marks: 75
Pass Marks: 27

Course Contents

Unit I: Mechanics — Teaching hours: 45

- Measurement - Needs, System of units, Simple Dimensions, Significant figures, Accuracy of measurement.
- Scalar and vector quantities - Meaning-Unit vector, Null vector. Distinction between them with examples.
- Addition and Resolution of vectors - Addition and resolution of vectors, Composition of vectors by its rectangular components. (With reference to displacement of velocity, force and momentum)
- Motion - Rest, Motion, Speed, Velocity, Acceleration (definition, types,, examples, representation). Equations of uniformity, Accelerated motion derivation, Problem solving based on equation only. Laws of motion (statements, types, examples with everyday life only). Linear momentum, Conservation of momentum (definition, examples problem solving) Projectile motion General derivation of time of flight, maximum height, horizontal range, application in daily life. Circular motion, Centripetal force, Centrifugal reaction force.
- Gravitation - Gravitational force, Newton's laws of gravitation, Mass and average density of earth,, Variation of 'g' with altitude and depth, Earths mass and its average density (meaning, derivation and calculations), Weight and weightlessness (meaning, examples), Freefall.
- Work, Power and Energy - Work (definition, unit, treatment, work done against gravitational force, examples) Power (definition, unit and examples). Energy (P.E; K.E, definitions, unit, derivations, inter conversion, conservation of energy with examples). Various sources of energy (brief account of various sources, implication, future needs of Nepal, Energy crisis).
  - a) Teaching Learning Activities - Lecture, Demonstration and Student activity- Verification of law of parallelogram, Demonstration, Measuring, Project work, Determination of 'g', survey of energy crisis in the community and alternative sources of energy used.
  - b) Teaching Materials - Scale, Vernier Callipers

Unit II: Hydrostatics — Teaching hours: 5

- Pressure, Variation in atmospheric pressure, Archimedes Principle
  - a) Teaching and Learning Activities - Lecture, Demonstration, Verification of Archimedes Principle, Student Activity and Determination of density of solids.
  - b) Teaching Materials - Hydrostatic Balance, Spring Balance.

Unit III: Wave motion and sound — Teaching hours: 25

- Vibratory motion - Simple Harmonic motion, meaning, characteristics, derivation of expression for displacement, velocity, acceleration and time period of a particle executing SHM, Simple pendulum and its laws, Derivation of its time period.
- Waves - Meaning, Types (Transverse, Longitudinal, Standing), Simple treatment with examples, Waves as carrier of energy, Compression waves (simple way), Sound waves.
- Speed of sound - Newton's formula and Laplace correction, Audible sound - Audible frequency range, Sound Intensity - Characteristics of sound, Musical and Noise (loudness, intensity level, pitch quality, simple treatment).
  - a) Teaching and Learning Activities - Lecture and Demonstration of waves in spring, Experimentation and Student Activity.
  - b) Teaching Materials - Spring

Q. No. 12 (2066)

What is Guthi system? How far its effective in present Nepal?

गुठी व्यवस्था भनेको के हो ? आजको नेपालमा यो कति प्रभावशाली छ ?

Q. No. 11 (2065)

What are the different methods of designing a questionnaire?

प्रश्नावली निर्माणका विभिन्न विधिहरू के के हुन् ?

Q. No. 6 (2064)

What is Guthi (trust) and what its contributions on the society of Nepal?

गुठी भनेको के हो ? र नेपाली समाजमा यसको के योगदान छ ?

Q. No. 11 (2063)

How is questionnaire prepared in the social survey?

सामाजिक सर्वेक्षणमा प्रश्नावली कसरी निर्माण गरिन्छ ?

Q. No. 5 (2063)

What is social service and how it helps the society?

सामाजिक सेवा के हो ? र यसले समाजलाई कसरी मद्दत पुर्‍याउँछ ?

Q. No. 10 (2061)

What are the main characteristics of Guthi system in Nepal?

नेपालको गुठी व्यवस्थाका मुख्य विशेषताहरू के के हुन् ?

Q. No. 9 (2059)

Mention the place of Guthi in the traditional Nepalese Society.

नेपालको परम्परागत समाजमा गुठीको स्थान उल्लेख गर्नुहोस् ।

Q. No. 10 (2058)

How do you generate data through interviews?

अन्तर्वार्ताबाट कसरी तथ्याङ्क संकलन गर्नुहुन्छ ?

Write short notes. (संक्षिप्त टिप्पणी लेख्नुहोस् ।)

Q. No. 12c (2069)

Sampling (छनौट)

Q. No. 12B (2068):   Questionnaire (प्रश्नावली)

Q. No. 12A (2069):   Paropakar (परोपकार)

Q. No. 12c (2068):   Rotary Club (रोटरी क्लब)

Q. No. 12B (2068):   Newspapers (समाचार पत्र)

Q. No. 12A (2068):   Questionnaire (प्रश्नावली)

Q. No. 12c (2065):   Rotary Club (रोटरी क्लब)

Q. No. 10 c (OR) (2062)

News Papers (समाचार पत्र)

Q. No. 10 c (OR) (2061)

Questionnaire (प्रश्नावली)

Q. No. 10B (OR) (2060)

Rotary Club (रोटरी क्लब)

Q. No. 10c (2056):   Rotary Club (रोटरी क्लब)

Q. No. 10B (2056):   Guthi (गुठी)

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Unit IV: Optics
Teaching hours: 15

- Reflection and refraction of light - Mirror, Glass Slab, Lens, Prism (definition, function, uses)
- Lens- Image formation, focusing by refraction, Magnification, Magnifying power, Power of lens, Dispersion, Spectrum. Optical instruments- Simple microscope, Compound microscope, Telescope (Astronomical refracting), Meaning, Construction, Working and Magnifying Power.
  - a) Teaching and Learning Activities: Lecture, Demonstration, Experimentation, Verification of laws of reflection and refraction of light, Demonstration of spectrum and Magnifying power and Project work.
  - b) Teaching Materials - Mirror, Glass slab, Prism, Lens.

Unit V: Magnetism and Electricity
Teaching hours: 15

- Magnetic elements - Declination, Inclination, Horizontal components of earths field (definition, meaning only)
- Magnetic effect of current - Oersted's experiment, Maxwell's cork Screw rule, Right hand rule, Amperes swimming rule. (meaning and examples)
- Faraday's laws of electromagnetic induction, Lenz's law, Self Induction (meaning and statement), Transformer (meaning, type, theory, power losses in a transformer and uses).
- AC Generator, Dynamo: Meaning, Principle, Simple Construction, Working and Derivation of induced emf.
- DC Generator - Meaning, Principle, Simple construction, working only.
  - a) Teaching and Learning Activities - Lecture, Demonstrations, Experimentation, Student Activity, Project Work.
  - b) Teaching Materials - Charts, Models.

Unit VI: Heat
Teaching hours: 15

- Concept of heat and temperature and its units
- Thermometry - Temperature, Scales, Kinetic interpretation, Definition, Scale, Types, Significance of scale.
- Thermal Expansion: Linear, Volume Expansion, meaning, Expansion, Derivation, Bimetallic Thermostat (meaning and uses)
- Specific heat - Solids, Liquids, Meaning, Determination, Measurement.
  - a) Teaching and Learning Activities: Lecture, Demonstrations of bimetallic strip, Experimentation, determination of linear expansion and Student activity.
  - b) Teaching Materials - Bimetallic strip.

Unit VII: Electrostatic Force
Teaching hours: 5

- Introduction, Types of charge, Insulator and Conductor, Quantization of electric charge (basic treatment only)
  - a) Teaching and Learning Activities- Lecture, Demonstration, Experimentation and Student Activity.
  - b) Teaching Materials -Testing of charges

Unit VIII: Modern Physics
Teaching hours: 10

- Cathode Rays, X-Rays, Radioactivity - Meaning, Properties, Uses only.
- Nuclear Reaction - Meaning, Type, Simple theoretical treatment only.
- Nuclear reactions in the Sun - Brief account only.
  - a) Teaching & Learning Activities - Lecture, Demonstration, Experimentation, Student Activity.
  - b) Teaching Materials - Charts, Demonstrations, Survey of X-Rays in community.

Unit IX: Astronomy **Teaching hours: 15**

- Important constituents of the Universe (Solar System, Stars, Galaxies (meaning and types)).
- Astronomical Instruments - Meaning, Types, Description, Uses, Advantages.
- Solar System - Distance, Size, Rotation, Mass, Surface temperature, Atmosphere, Significance of study. (Simple descriptive treatment, Comparative study)
- Galaxy - Meaning and types
- Stars - Birth and Death of stars (different stages) and Significance.
  a) Teaching and Learning Activities - Lecture and Demonstration, Survey, Project.
  b) Teaching Materials - Charts, Models, Observation appliances.

PRACTICAL

Full Marks: 25

Teaching hour: 2 periods / week

This list of practical activities for class eleven (science education) includes those experiments which are to be demonstrated and those which the students themselves are to do. The two categories have not however been separated.

Objectives:

After completing the practical course students will have skill in: -

1. developing skills of making careful observations, collecting data and calculating the results of activity/experiments.
2. developing the abilities to interpret the results of the activity /experiments and understand implications of the results.
3. developing skills of setting up appropriate apparatus for activity/experiments.
4. improving apparatus suitable for school level activity.

List of activities /experiments

1. Measurement of weight, length, volume, density (2)
2. Simple experiments involving timing and oscillations. (1)
3. Simple activities to study the expansion solids and liquids. (2)
4. Optic experiments requiring the plotting of rays of light using pins. (1)
5. Optic experiments with mirrors, lens, slabs and prism. (3)
6. Suitable experiments on heat (thermometry, expansion). (1)
7. Prepare models and charts of solar system. (2)
8. Study electrostatic properties by improvised apparatus. (1)
9. Prepare improvised apparatus related to school curriculum. (Heat, Mechanics, Magnetism, Electricity, Light, Electrostatics) (6)
10. Study-magnetic properties of iron, steel. (1)
11. Prepare working model of electric motor. (2)
12. Magnetize given material using direct current. (1)

Note: (No. of Activities /Experiments) eg. (2)

Evaluation Scheme

Out of the total coverage theory portion will cover 75% and rest 25% will be covered by practical. In theory portion Questions will be of two groups

Long questions each carrying 9.5 marks 2 to be attempted out of 4 choices.	19
Short questions each carrying 4.0 marks 14 to be attempted out of 20 choices.	56

Total: 75

Theory : 75 marks

Units	Title	Short Questions		Long Questions	
		To be attempted	Choices	To be attempted	Choices
Unit I	Mechanics		5		1
Unit II	Hydrostatics		1		
Unit III	Wave motion & sound		3		1
Unit IV	Optics		2		
Unit V	Heat		2		1
Unit VI	Magnetism & Electricity	14	2	2	
Unit VII	Electrostatic Force		1		
Unit VIII	Modern Physics		2		1
Unit IX	Astronomy		2		
	Total		20		4

Practical Marks

1) Experiment (Theory 2, Obs. 4, Results 4)   10
2) Activity (School Curriculum) improvisation, item preparation-   8
3) Oral / Viva -   3
4) Note book -   4
                                                                            25

Textbooks / references

1) J.M. Pradhan, Text book of Practical Physics, Ratna Pustak Bhanbar
2) N. Subrahmanyam Brij Lal Principle of Physics, S. Chand and Company
3) J.M Pradhan, Textbook of Physics
4) Gurdeep and Naurala, Physics for Class XI and XII.

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MODEL QUESTION
[HSEB EXAMINATION 2069 (2012)]

Time: 3 hrs

Full Marks: 75
Pass Marks: 27

Group 'A': Short answer questions

Attempt any fourteen questions: 14x4=56

1. Define dimension of a physical quantity. Explain significant figures with examples.
[From Unit I]

2. State parallelogram law of vector addition. Derive the expression for magnitude of resultant vector.
[From Unit I]

3. State Newton's laws of motion. Derive an expression for measurement of force.
[From Unit I]

4. What is centripetal force? Derive the relation $\frac{v^2}{r}$, where symbols have their usual meanings.
[From Unit I]

5. State and prove the principle of conservation of energy.
[From Unit I]

6. What is weightlessness? Explain various sources of energy in Nepal.
[From Unit I]

7. State Archimedes principle. How can you verify this law in laboratory?
[From Unit II]

8. State simple harmonic motion and derive expressions for its velocity and acceleration.
[From Unit III]

9. Explain loudness, pitch and quality of musical sound.
[From Unit III]

10. Differentiate between transverse and longitudinal wave with suitable examples.
[From Unit III]

11. Obtain the relation $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$ in case of concave mirror where symbols have their usual meaning.
[From Unit IV]

12. What is power of lens? Explain dispersion of light in prism.
[From Unit IV]

13. The angle of prism is 60° and the minimum deviation of light through the prism is 39°. Calculate the refractive index of the glass.
[From Unit IV]

14. Explain the terms declination, inclination and horizontal component of earth's magnetic field.
[From Unit V]

15. State and explain Faraday's laws of electromagnetic induction. What is Lenz's law?
[From Unit V]

16. Define specific heat. Explain determination of specific heat of a solid in laboratory.
[From Unit VI]

17. What are X-rays? How are these produced? Write any four properties of X-rays?
[From Unit VIII)

18. Explain the nuclear reaction with suitable examples.
[From Unit VIII]

19. Discuss in brief the important constituents of the universe.
[From Unit IX]

20. Explain briefly the death of star.
[From Unit IX]

Group 'B' : Long answer questions

Attempt any two questions.   2x9.5=19

21. What is acceleration due to gravity? Explain the variation of g with altitude and depth.
[From Unit I]

22. Define coefficient of linear expansion and coefficient of cubical expansion. Obtain the relation between them. Describe how bimetallic thermostat works.
[From Unit VI]

23. Explain the terms visual angle and magnifying power in optical instrument. Define magnifying power is simple microscope.
[From Unit IV)

24. Describe the structure and working of an AC generator. Derive expression for induced emf in it.
[From Unit V]

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1 | Mechanics

Q. No. 21 (2069)

What is acceleration due to gravity? Explain the variation of g with altitude and depth.

Q. No. 5 (2069)

What is weightlessness? Explain various sources of energy in Nepal.

Q. No. 6 (2069)

State and prove the principle of conservation of energy.

Q. No. 4 (2069)

What is centripetal force? Derive the relation $\frac{v^2}{r}$, where symbols have their usual meanings.

Q. No. 3 (2069)

State Newton's laws of motion. Derive an expression for measurement of force.

Q. No. 2 (2069)

State parallelogram law of vector addition. Derive the expression for magnitude of resultant vector.

Q. No. 1 (2069)

Define dimension of a physical quantity. Explain significant figures with examples.

Q. No. 22 (2068)

A projectile is fired from the ground at an angle θ with the horizontal. Derive expression for the maximum height obtained, the time of flight and the horizontal range.
A ball p of mass 0.1 kg moving with velocity of 6 ms⁻¹ collides directly with a ball Q of mass 0.2 kg at rest. Calculate their common velocity if both balls move off together.

Q. No. 5 (2068)

Define power with its units. Show that the power of a moving object is the product to force and its velocity.

Q. No. 4 (2068)

Define acceleration due to gravity. Derive an expression for the value of 'g' at a depth 'd' below the surface of the earth.

Q. No. 3 (2068)

Define angular displacement and angular velocity. Derive a relation between angular velocity and linear velocity.

Q. No. 2 (2068)

Write differences between scalars and vectors. What is a unit vector?

Q. No. 1 (2068)

Define dimensions of a physical quantity. Find the dimensional formula of pressure and energy.

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2 | Hydrostatics

Q. No. 7 (2069)

State Archimedes's Principle. How can you verify this law in laboratory?

Q. No. 6 (2068)

A piece of wood of density 0.32 cm⁻³ floats in oil of density 0.80 gcm⁻³. What fraction of volume of the wood is above the surface of oil?

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3 | Wave, Motion and Sound

Q. No. 10 (2069)

Differentiate between transverse and longitudinal wave with suitable examples.

Q. No. 9 (2069)

Explain loudness, pitch and quality of musical sound.

Q. No. 8 (2069)

State simple harmonic motion and derive expressions for its velocity and acceleration.

Q. No. 21 (2068)

What is simple pendulum? Show that the motion of a simple pendulum is simple harmonic and calculate its time period. Also mention the laws of simple pendulum.

Q. No. 8 (2068)

Discuss the Newton's formula for the velocity of sound in air with Laplace's correction.

Q. No. 7 (2068)

Write differences between transverse wave and longitudinal wave with examples. What do you mean by pitch of a musical sound?

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4 | Optics

Q. No. 23 (2069)

Explain the terms visual angle and magnifying power in optical instrument. Define magnifying power is simple microscope.

Q. No. 13 (2069)

The angle of prism is 60° and the minimum deviation of light through the prism is 39°. Calculate the refractive index of the glass.

Q. No. 12 (2069)

What is power of lens? Explain dispersion of light in prism.

Q. No. 11 (2069)

Obtain the relation, $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$ in case of concave mirror, where symbols have their usual meaning.

Q. No. 23 (2068)

Discuss with neat and labeled ray diagram the construction and working of a compound microscope and calculate its magnifying power.

A ray of lights is incident at 60° in air on an air glass surface If the refractive index of glass is 1.5 find the angle of refraction in the glass.

Q. No. 20 (2068)

Define galaxy. Mention different types of galaxies.

Q. No. 10 (2068)

Define dispersion of lights and explain the cause of dispersion.

Q. No. 9 (2068)

Derive the relation, $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$ for a concave mirror, where the symbols have their usual meanings.

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5 | Magnetism and Electricity

Q. No. 24 (2069)

Describe the structure and working of an AC generator. Derive expression for induced emf in it.

Q. No. 15 (2069)

State and explain Faraday's laws of electromagnetic induction. What is Lenz's law?

Q. No. 14 (2069)

Explain the terms declination, inclination and horizontal component of earth's magnetic field.

Q. No. 13 (2068)

Describe the structure and working of an AC generator.

Q. No. 12 (2068)

What is electromagnetic induction? State and explain Faraday's laws of electromagnetic induction.

Q. No. 11 (2068)

Define angle of inclination. Explain how it varies from the equator to the pole of the earth.

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6 | Heat

Q.N. 22 (2069)

Define coefficient of linear expansion and coefficient of cubical expansion. Obtain the relation between them. Describe how bimetallic thermostat works.

Q. No. 16 (2069)

Define specific heat. Explain, Determination of specific heat of a solid in laboratory.

Q.N. 16. (2068)

Describe the method of mixture to determine the specific heat of a. solid.

Q. No. 15 (2068)

Define the coefficients of linear expansion and cubical expansion. On what principle does the bimetallic thermostat work?

Q. No. 14 (2068)

Write differences between heat and temperature. A certain temperature has the same reading on both Celsius and Fahrenheit thermometers. Find the temperature.

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7 | Electrostatic Force

Q. No. 17 (2068)

What is meant by quantization of charge? Explain.

Q. No. 24 (2068)

Write the properties of α, β and γ - rays Write uses of these radiations.

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8 | Modern Physics

Q. No. 18 (2069)

Explain the nuclear reaction with suitable examples.

Q. No. 17 (2069)

What are x - rays? How are these produced? Write any four properties of x- rays.

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9 | Astronomy

Q. No. 20 (2069)

Explain briefly the death of star.

Q. No. 19 (2069)

Discuss, in brief, the important constituents of the universe.

Q. No. 19 (2068)

Explain in brief, how a star is born.

Q. No. 18 (2068)

What is universe? What are its constituents?

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