Version No.			

ROLL NUMBER						

Answer Sheet No._____

Sign. of Candidate_____

Sign. of Invigilator_____

PHYSICS HSSC–I (3rd Set)

SECTION – A (Marks 17)

Time allowed: 25 Minutes

Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. **Do not use lead pencil.**

Q.1 Fill the relevant bubble for each part. Each part carries one mark.

(1) The percentage error in the measurement of mass and speed are 2% and 3% respectively. How much will be the maximum percentage error in the estimation of K.E obtained?

A. 1% ◯ B. 4% ◯

C. 5% ◯ D. 8% ◯

(2) A person first displaces 10 units towards North. After second displacement he is 7 units towards North. His 2nd displacement was:

A. 3 units towards West ◯ B. 3 units towards South ◯

C. 3 units towards North ◯ D. 3 units towards East ◯

(3) For a projectile, if g = 10ms^{-2} the ratio of maximum height reached to square of flight time will be:

A. 5 : 1 ◯ B. 5 : 2 ◯

C. 5 : 4 ◯ D. 10 : 1 ◯

(4) What is the product of $(\hat{\imath} \times \hat{\jmath}).\hat{k}$ equal to:

A. $-\hat{k}$ ◯ B. 1 ◯

C. -1 ◯ D. $+\hat{k}$ ◯

(5) When a force is applied on a body, which one of the following physical quantity will **NOT** change?

A. Mass ◯ B. Velocity ◯

C. Position ◯ D. Acceleration ◯

6. K.E of a body is increased by 300%. What is the percentage increase in momentum?

A. 100% ◯ B. 200% ◯

C. 300% ◯ D. 400% ◯

(7) When the speed of your car doubles, by what factor does its kinetic energy increase?

A. $\sqrt{2}$ ◯ B. 2 ◯
C. 4 ◯ D. 8 ◯

(8) 1° is equal to:

A. 0.01745 rad ◯ B. 57 rad ◯
C. 0.1745 rad ◯ D. 2.9 rad ◯

(9) The value of g at a height equal to the radius of earth from its surface is given as:

A. $g_h = g$ ◯ B. $g_h = \frac{g}{4}$ ◯
C. $g_h = \frac{g}{9}$ ◯ D. $g_h = \frac{g}{2}$ ◯

(10) The lift of an aeroplane is based on the principle of _____.

A. Torricelli's theorem ◯ B. Equation of continuity ◯
C. Benoulli's theorem ◯ D. Stokes theorem ◯

(11) If length of second pendulum is L, then the length of pendulum having a period of 1s will be:

A. $\frac{L}{2}$ ◯ B. 2L ◯
C. 4L ◯ D. $\frac{L}{4}$ ◯

(12) Which one of the following factor does not change during resonance?

A. Amplitude ◯ B. Velocity ◯
C. Acceleration ◯ D. Time period ◯

(13) A stretched string 4m long and it has 4 loops of stationary waves, then the wave length is:

A. 4m ◯ B. 3m ◯
C. 2m ◯ D. 1m ◯

(14) A sound source is moving towards stationary listener with $\frac{1}{10^{th}}$ of the speed of sound. The ratio of apparent to real frequency is:

A. $\frac{11}{10}$ ◯ B. $\left[\frac{11}{10}\right]^2$ ◯
C. $\left[\frac{9}{10}\right]^2$ ◯ D. $\frac{10}{9}$ ◯

(15) Signal from a remote control to the device operated by it travels with the speed of:

A. Sound ◯ B. Light ◯
C. Ultrasonic ◯ D. Supersonics ◯

(16) Light of wavelength λ is incident normally on a diffraction grating for which the split spacing is equal to 3λ. What is the sine of the angle $[\sin(\theta)]$ between the second order maximum and the normal?

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

(17) Formation of clouds in atmosphere is due to _____ process.

A. isothermal ◯ B. isochoric ◯
C. isobaric ◯ D. adiabatic ◯

Federal Board HSSC-I Examination
Physics Model Question Paper
(Curriculum 2006)

Time allowed: 2.35 hours Total Marks: 68

Note: Answer any fourteen parts from Section 'B' and attempt any two questions from Section 'C' on the separately provided answer book. Write your answers neatly and legibly.

SECTION – B (Marks 42)

Q.2 Attempt any **FOURTEEN** parts. All parts carry equal marks. (14× 3 = 42)

i. Under what circumstances the *x*-component of a force is double of its *y*-component?

ii. Find the work done if applied force $F = 3\hat{\imath} + 2\hat{\jmath}(N)$ moves a block from point (2, -1) to point (6, 4).

iii. Calculate the angle of projection for which range of projectile becomes four times than height of projectile.

iv. If $m_2 = 2m_1$ and $v_2 = \frac{v_1}{2}$ then for elastic collision in one dimension, calculate velocities after collision.

v. The human pulse and the swing of a pendulum are possible time units. Why are they **NOT** often used?

vi. The moon's radius is 16km, g_m = 1.6ms^{-2} on its surface. Calculate the escape velocity at moon surface.

vii. Why does a diver change its body position before and after diving in the pool? Explain.

viii. Earth satellite is a gravity free system. Comment and justify.

ix. How large must a heating duct be if air moving 5 ms^{-1} along it can replenished in the air in a room of 200 m^3 volume every 1 hour? Assume the air density remains constant.

x. How is a venturi duct used in the carburetor of a car engine?

xi. During S.H.M, in a mass-spring system, calculate the displacement at which K.E. becomes equal to P.E.

xii. Prove that $x = x_0\sqrt{\frac{1-v^2}{v_0^2}}$ where $v = v_0\sqrt{\frac{1-x^2}{x_0^2}}$ in SHM.

xiii. Calculate the temperature at which speed of sound becomes $\frac{3}{2}$ times of its speed at 50°C.

xiv. Explain why sound travels faster in warm air than in cold air.

xv. A thin oil film on the surface of water shows different colors. Why?

xvi. A beam of X-rays of wavelength 0.3 nm is incident on a crystal and gives a first order maximum when the glancing angle is 9°. Find the atomic spacing.

xvii. Check the homogeneity of equation $\frac{l}{g} = \frac{m}{k}$.

xviii. Can we realize an ideal simple pendulum?

xix. Explain why adiabatic curve is more steeper than isothermal curve?

xx. If $\vec{A}$ and $\vec{B}$ are representing two adjacent sides of parallelogram then show that $|\vec{A} \times \vec{B}| = Area\ of\ parallelogram.$

SECTION – C (Marks 26)

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

Q.3 a. What is absolute P.E? Derive an expression for it using diagram. **(6)**

b. Show that $C_p - C_v = R$. **(4)**

c. What is the effect on order of spectra of diffraction grating if the numbers of lines ruled in grating are increased? **(3)**

Q.4 a. What is the First Law of thermodynamics? Explain it. **(6)**

b. The absorption spectrum of faint galaxy is measured and wave length of one of the lines identified as the calcium ∝ line is found to be 478 nm. The same line has a wavelength of 397 nm, when measured in laboratory. Calculate the speed of galaxy relative to Earth. **(4)**

c. Prove that $P = \vec{F}.\vec{v}$. **(3)**

Q.5 a. What is angular momentum? Explain the law of conservation of angular momentum. **(6)**

b. A spherical ball of weight 80 N and radius 40 cm is to be lifted over a 10 cm step. How much minimum force is required to lift it on step if force is applied at half of the radius of sphere from centre? **(4)**

c. With the help of an example, show that impulsive force increases by decreasing the collision time. **(3)**

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PHYSICS HSSC-I (3rd Set)

Student Learning Outcomes Alignment Chart

(Curriculum 2006)

SECTION-A

Q.1

(1) Assess the uncertainty in a derived quantity by simple addition of actual, fractional or percentage uncertainties.

(2) Determine the sum of vectors using Head-to-Tail rule.

(3) Evaluate using equations of uniformly accelerated motion that for a given initial velocity of frictionless projectile
   1. How higher does it go?
   2. How long will it remain in air?

(4) Describe scalar and vector product of two vectors in terms of angle between them.

(5) Apply Newton's laws to explain the motion of objects in a variety of context.

(6) Utilize work-energy theorem in a resistive medium to solve problems.

(7) Utilize work-energy theorem in a resistive medium to solve problems.

(8) Solve problems by using $S = r\theta$ and $v = r\omega$.

(9) Define the term orbital velocity and derive relationship between orbital velocity, the gravitational constant, mass and the radius of the orbit.

(10) Interpret and apply Bernoulli's effect in daily life, in the filter pump, venturi meter, in atomizers, flow of air over an acrofoil and in blood physics.

(11) Analyze the motion of a simple pendulum is SHM and calculate its time period.

(12) Describe qualitatively the factors which determine the frequency response and sharpness of the resonance.

(13) Describe modes of vibration of strings.

(14) Explain the observed change in frequency of a mechanical wave coming from a moving object as it approaches and moves away (i.e. Doppler effect).

(15) Explain that Doppler effect is also applicable to electromagnetic waves.

(16) Describe the use of diffraction grating to determine the wavelength of light and carry out calculations using $d \sin\theta = m\lambda$

(17) Describe the first law of thermodynamics expressed in terms of the change in internal energy, the heating of the system and work done on the system.

SECTION-B

Q.2

i. Represent a vector into two perpendicular components.

ii. Describe the concept of work in terms of the product of force F and displacement d in the direction of force (work as scalar product of F and d).

iii. Evaluate using equations of uniformly accelerated motion that for a given initial velocity of frictionless projectile how far would it go along the level land?

iv. Solve different problems of elastic and inelastic collisions between two bodies in one dimension by using law of conservation of momentum.

v. State the conventions for indicating units as set out in the SI units.

vi. Explain the concept of escape velocity in term of gravitational constant *G*, mass *m* and radius of planet *r*.

vii. Explain conservation of angular momentum as a universal law and describe examples of conservation of angular momentum.

viii. Explain that the objects in orbiting satellites appears to be weightless.

ix. Describe equation of continuity Av = Constant, for the flow of an ideal and incompressible fluid and solve problems using it.

x. Interpret and apply Bernoulli's effect in daily life, in the filter pump, venturi meter, in atomizers, flow of air over an acrofoil and in blood physics.
xi. Describe the interchange between K.E. and P.E. during SHM.
xii. Describe that when an object moves in a circle, the motion of its projection on the diameter of the circle is SHM.
xiii. Identify the factors on which speed of sound in air depends.
xiv. Explain that speed of sound depends on the medium's properties in which its propagates and describe Newton's formula for speed of waves.
xv. Explain colour pattern due to interference in thin films.
xvi. Describe the phenomena of diffraction of X-rays through crystals.
xvii. Check the homogeneity of physical equations by using dimensionality and base units.
xviii. Analyze the motion of a simple pendulum is SHM and calculate its time period.
xix. Explain that first law of thermodynamics expresses the conservation of energy.
xx. Describe vector product of two vectors in terms of angle between them.

SECTION-C

Q.3 a. Define potential at a point as work done in bringing unit mass from infinity to that point.
b. Apply first law of thermodynamics to derive Cp – Cv = R.
c. Describe the use of a diffraction grating to determine the wavelength of light and carryout calculations using $d \sin\theta = m\lambda$.

Q.4 a. Describe the first law of thermodynamics expressed in terms of the change in internal energy, the heating of the system and work done on the system.
b. Explain that Doppler effect is also applicable to electromagnetic waves.
c. Express power as scalar product of force and velocity.

Q.5 a. Explain conservation of angular momentum as a universal law and describe examples of conservation of angular momentum.
b. Solve two dimensional problems involving forces (static) using 1^{st} and 2^{nd} conditions of equilibrium.
c. Describe the effect of an impulsive force on the momentum of an object and the effect of lengthening the time, stopping, or rebounding from the collision.

PHYSICS HSSC-I (3rd Set)

Table of Specifications

Topics	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Marks	% age
Knowledge based	2(v)3			3(a)6	1(8)1 2(vii)3 2(viii)3	1(10)1	1(12)1 2 (xviii)3	1(15)1 2(xiv)3	2(xv)3	1(17)1 4(a)6	35	30.2%
Understanding based	1(1)1 2(xvii)3	1(2)1 1(4)1 2(i)3 2(xx)3	1(3)1 2(ii)3 2(iii)3 5(c)3	1(6)1 1(7)1 2(vi)3 4(c)3	1(9)1 5(a)6	2(x)3	1(11)1 2(xi)3	1(13)1	2(xvi)3 3(c)3	2(xix)3 3(b)4	58	50%
Application based		5(b)4	1(5)1 2(iv)3			2(ix)3	2(xii)3	1(14)1 2(xiii)3 4(b)4	1(16)1		23	19.8%
Total marks	7	12	14	14	14	7	11	13	10	14	116	100%

KEY:

1(1)(01)

Question No (Part No.) Allocated Marks

Note: (i) The policy of FBISE for knowledge based questions, understanding based questions and application based questions is approximately as follows:

a) 30% knowledge based.
b) 50% understanding based.
c) 20% application based.

(ii) The total marks specified for each unit/content in the table of specification is only related to this model question paper.

(iii) The level of difficulty of the paper is approximately as follows:

a) 40% easy
b) 40% moderate
c) 20% difficult