FBISE PRACTICAL BASED ASSESMENT (PBA)

Guidelines/instructions for teachers/paper setters:

i. There will be two Sections in PBA paper. In Section-A there will be one question having parts in it. Similarly, in Section-B there will be one question having parts in it.

ii. In Section-A, Question No. 1 will be based only on one experiment taken from Part-I of the list of practicals.

iii. In Section-B, Question No. 2 will be based on multiple experiments taken from Part-II of the list of practicals.

iv. Ratio of Part-I practicals is 60% while ratio of Part-II practicals is 40% in the PBA paper.

v. Draw diagram(s) if asked for.

vi. In the new pattern of practicals i.e. Practical Based Assessment (PBA), there will be no marks for practical note books and viva voce. However, students may record procedures, observations, apparatus and calculation etc on any type of plain papers/work sheets / practical folder for their future memory of all aspects of practical performance in order to attempt the PBA Examination amicably.

vii. It may be noted that performance of all the prescribed practicals is mandatory in the laboratories during the whole academic year and only those students will be able to attempt the PBA who will have performed the practicals in the laboratories as per requirement of each practical.

LIST OF PHYSICS PRACTICALS HSSC-I

Part-I (60% of practical marks --- 9 Marks)

1. Measure the diameters of a few ball bearings of different sizes using Screw Gauge andestimate their volumes. Mention the uncertainty in each result.
2. Determine the radius of curvature of convex lens and a concave lens using aspherometer.
3. Determine the weight of a body by vector addition of forces.
4. Verify the two conditions of equilibrium using a suspended meter rod.
5. Investigate the value of 'g' by free fall method using electronic timer.
6. Verify that the time period of the simple pendulum is directly proportional to the square root of its length and hence find the value of 'g' from the graph.

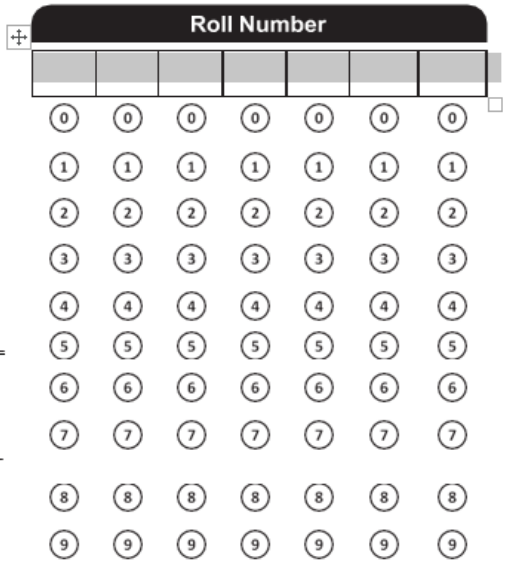
Part-II (40% of practical marks ----- 6 Marks)

1. Determine the moment of inertia of a fly wheel.
2. Determine the acceleration due to gravity by oscillating mass-spring system. 3-Determination of frequency of A.C by Meld's apparatus / electric sonometer.
3. Investigation of the laws of vibration of stretched strings by sonometer or electromagneticmethod.
4. Determine the wavelength of sound in air using stationary waves and to calculate thespeed of sound using resonance tube.
5. Measure the mechanical equivalent of heat by electric method.

FEDERAL BOARD OF INTERMEDIATE AND SECONDARY EDUCATION ISLAMABAD

Subject: PHYSICS HSSC-I
Paper: Practical Based Assessment (PBA)

Total Marks: 15 **Time: 60 minutes**



Name of Examination: _____

Centre Code: _____

Date: _____

Sig. of Dy. Supdt. _____

Instructions for students:

1. Carefully read all the questions and then answer them at the specified spaces.
2. Use black or blue ball point.
3. Marks are mentioned against all questions in the brackets [ ].
4. Students may use the last page for rough work (if required).
5. Answer the questions as per given instructions.

MODEL PAPER HSSC-I PHYSICS

Note: Attempt all questions and answer the questions within the provided spaces.

SECTION-A

Q 1: A student is finding the weight of a metre rule using the apparatus shown in Figure 1.

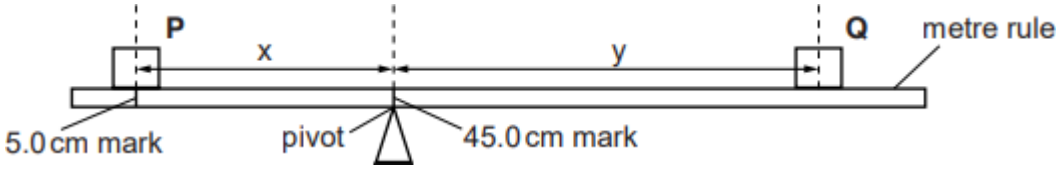


Figure 1 (not to scale)

- He places the load P = 1.00 N on the metre rule at the **5.0 cm** mark.
- He places the metre rule on the pivot at the **45.0 cm** mark.
- He places load Q = 0.80 N on the rule and adjusts its position so that the metre rule is as near as possible to being balanced.

He measures

- the distance x (between the centre of load P and the pivot)
- the distance y (between the centre of load Q to the pivot)

He repeats the procedure, placing the load P at the **10.0 cm** mark, at the **15.0 cm** mark, at the **20.0 cm** mark and at the **25.0 cm** mark. The readings are shown in Table.

Table 1

x (____)	**y** (____)	**A = P x** (____)	**B = Q y** (____)
40.0	42.5		
35.0	36.0		
30.0	30.0		
25.0	24.0		
20.0	17.5		

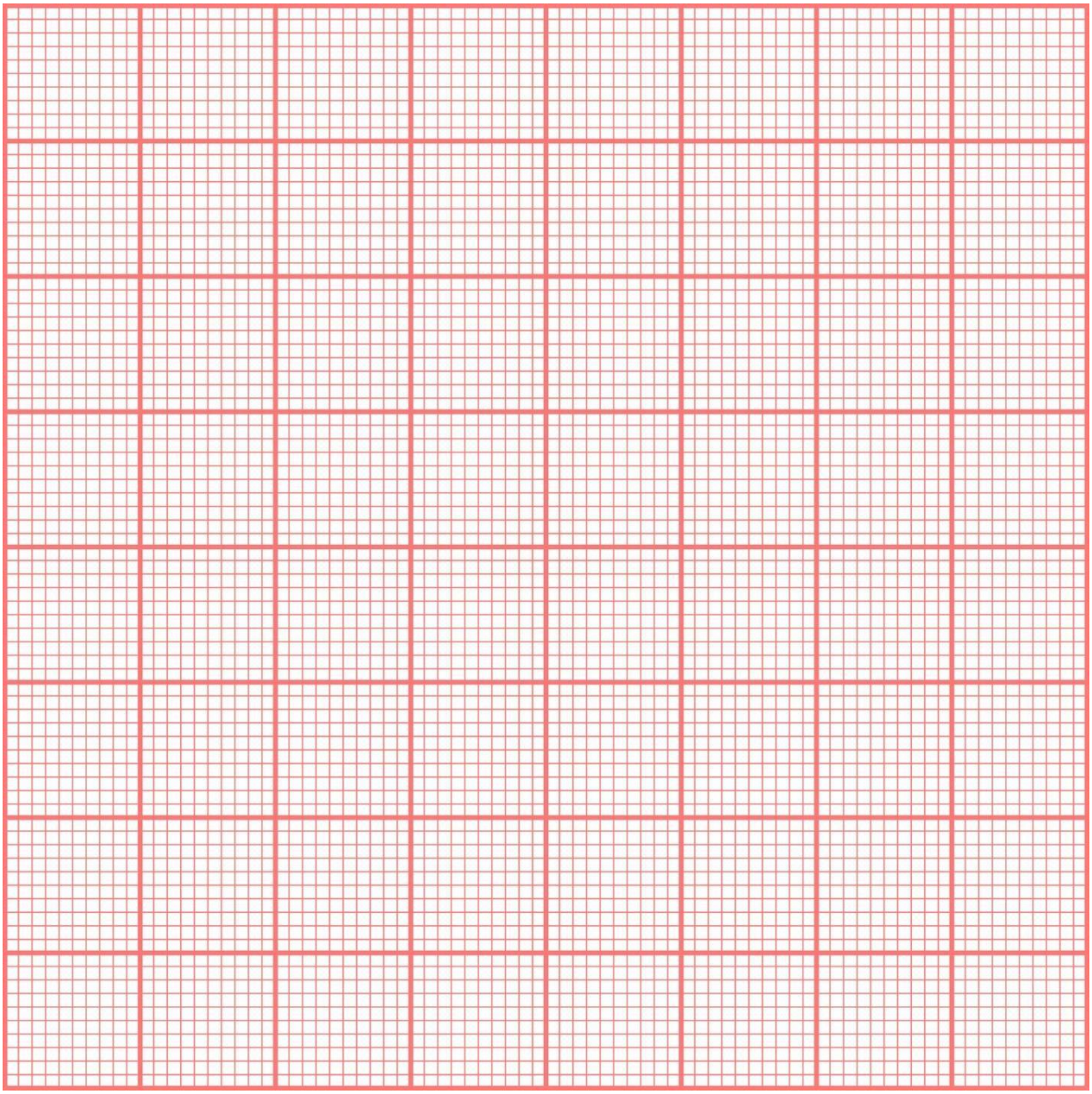
(i) In the table 1:

(a) Complete the column **headings/units**. [1]

(b) Complete the column **A = P x**. [1]

(c) Complete the column **B = Q y**. [1]

(ii) Plot a graph of A (y-axis) against B (x-axis). Start both axes at the origin (0,0). [1]



(iii) Using the graph, determine the vertical intercept Y (the value of A, when B = 0 N cm). Show clearly on the graph how you obtained this value.

Y = _____ [1]

(iv) Calculate the weight W of the metre rule using the equation W = Y/z , where z = 5.0 cm.

W = _____ [1]

(v) Suggest one practical reason why it is difficult to obtain exact results with this experiment. [1]

_____

_____

(vi) The student uses an accurate electronic balance to obtain a second value for the weight of the metre rule.

weight obtained on the balance = 1.24 N

State and justify whether the two values for the weight agree within the limits of experimental accuracy.

Statement [1]

_____

_____

Justification [1]

_____

_____

SEECTION-B

Q 2: A student is carrying out an experiment to determine the time period of mass-attached to aspring using the setup as shown in the figure 2.

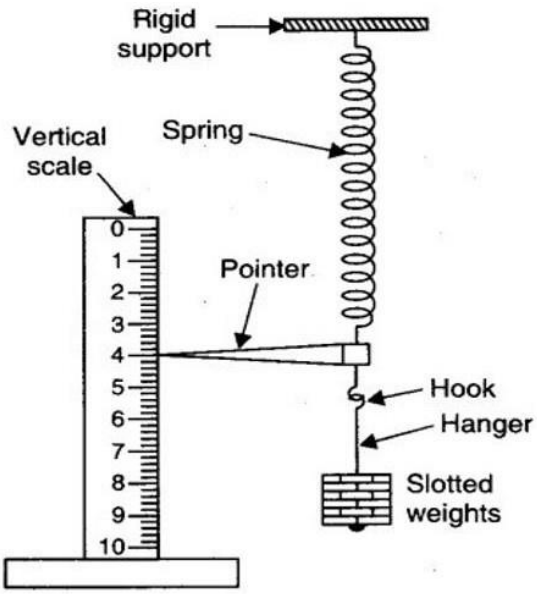


Figure 2

He adjusted the position of pointer at **0.0 cm** when there is no load suspended with the spring. When a 100 g mass is suspended with the spring, then the new position is shown in the figure.

(i) What is the value of force that 100 g of mass exerts on the spring? [1]

Force = _____ N

(ii) What is the extension in the spring? [1]

Extension = _____ cm

(iii) What is the value of spring constant k? [1]

k = _____

(iv) What is the time period of mass-attached to the spring if the mass is pushed downward and left to oscillate? [1.5]

T = _____

(v) Using the result of part (iv), find frequency of the oscillations. [1.5]

f = _____

ROUGH WORK

Version No.			

ROLL NUMBER						

Answer Sheet No._____

Sign. of Candidate_____

Sign. of Invigilator_____

PHYSICS HSSC–I (2nd 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. In a simple pendulum experiment, percentage errors in length "L" and time "T" are 0.1% and 2% respectively. What is the percentage uncertainty in the value of g?

A. 4.1% ◯ B. 3.1% ◯

C. 5% ◯ D. 2.1% ◯

2. The dimension ratio of power to work is:

A. $1 : T^2$ ◯ B. $1 : T^{-2}$ ◯

C. $1 : T^{-1}$ ◯ D. $1 : T$ ◯

3. The resultant of two forces having magnitude of 5N and 6N is 1N. The angle between them is:

A. 60° ◯ B. 180° ◯

C. 90° ◯ D. 30° ◯

4. A man carries a bucket of water of 1kg for 10m then work done by gravity will be:

A. 10 J ◯ B. 5 J ◯

C. 2.5 J ◯ D. Zero ◯

5. A body rotating in a circle of radius 0.5m with an angular speed 10rad/s its tangential velocity is:

A. 2 m/s ◯ B. 5 m/s ◯

C. 10 m/s ◯ D. 15 m/s ◯

6. Height of the closest orbit of the satellite above the Earth is:

A. 300 km ◯ B. 250 km ◯

C. 500 km ◯ D. 400 km ◯

7. Entropy of hot reservoir of a heat engine:

A. Increases ◯
B. Decreases ◯
C. Is zero ◯
D. Remains constant ◯

8. Resonance curve is fairly flat for:
A. Heavily damped system ◯
B. Moderately damped system ◯
C. Lightly damped system ◯
D. Equally flat for all cases ◯

9. Fringe width in Young's double slit experiment increases when:
A. Wavelength increases ◯
B. Distance between source and screen decreases ◯
C. Distance between slits increases ◯
D. The width of the slits increases ◯

10. The regular array of atoms in a crystal forms a natural diffraction grating with spacing of:
A. 10^{-10}m ◯ B. 10^{-6}m ◯
C. 10^{12}m ◯ D. 10^{15}m ◯

11. Work done by centripetal force of 10 N moving in a circle of radius 5 m will be:
A. Zero J ◯ B. 25 J ◯
C. 50 J ◯ D. 75 J ◯

12. A particle is falling freely through a viscous medium with terminal velocity. Its acceleration is:
A. a = g ◯ B. a > g ◯
C. a < g ◯ D. a = 0 ◯

13. The fundamental frequency of a closed organ pipe is 50Hz. The frequency of second overtone is:
A. 100 Hz ◯ B. 15 Hz ◯
C. 200 Hz ◯ D. 250 Hz ◯

14. When a tuning fork of frequency 100Hz is sounded with a tuning fork B, the number of beats per second is 2. After waxing B, the number of beats per second is 1. Frequency of fork B is:
A. 98 Hz ◯ B. 99 Hz ◯
C. 101 Hz ◯ D. 102 Hz ◯

15. A vector **A** is along positive x-axis. If **B** is another vector such that $\mathbf{A} \times \mathbf{B} = 0$ then $\vec{\boldsymbol{B}}$ would be:
A. $4\mathbf{j}$ ◯ B. $-4\mathbf{i}$ ◯
C. $-(\mathbf{i}+\mathbf{j})$ ◯ D. $(\mathbf{j}+\mathbf{k})$ ◯

16. A man standing on the edge of cliff throws a stone vertically upwards with certain speed. He then throws another stone downwards with same speed. Find the ratio of the speed of two stones when they hit the ground.
A. 1 : 1 ◯ B. 1 : 2 ◯
C. 1 : 3 ◯ D. 1 : 4 ◯

17. Angular speed of hour hand of a clock is:
A. 1 rev/60min ◯ B. 1 rev/12hr ◯
C. 1 rev/24hr ◯ D. 1 rev/60sec ◯

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. Find distance travelled by light in one year.

ii. Enlist three main causes of errors in measurement.

iii. Calculate the angle between two vectors for which magnitude of dot and cross product is same.

iv. Why tightening of screw with long arm spanner is **NOT** recommended?

v. Why First law of motion is also called 'law of inertia'?

vi. A projectile has maximum range at 200 m. What will be the maximum height attained by it?

vii. What is meant by conservative field. Give two examples.

viii. A proton accelerates from rest to a speed 5×10^7m/s, covers a distance of 10 cm. Find the force required for it.

ix. How moment of inertia of a ring and a disc can be equal?

x. Why racing cars and boat are designed eblonged shape?

xi. What do you understand by Stokes law. Also write its formula?

xii. The depth of upper hole of a liquid container is h. What will be the depth of lower hole where speed of efflux of liquid become double than the upper hole?

xiii. What are the practical examples of free and forced oscillations?

xiv. Why the length of simple pendulum is taken upto centre of bob?

xv. Explain frequency and phase change of mechanical wave after reflection from rare to denser.

xvi. In Young's double slit experiment, to measure the wavelength of light, it is desirable to have the screen as far from the slits as possible. Why?

xvii. How can we obtain coherent source of light?

xviii. Calculate the wavelength of light used when 2000 fringes are observed by moving the mirror of Michelson interferometer by 0.5 mm.

xix. Calculate work done by thermodynamic system during volume change.

xx. Two Carnot engines 'A' and 'B' have their sources at 327°C and 227°C and sinks at 127°C and 27°C respectively. Compare their efficiencies.

SECTION – C(Marks 26)

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

Q.3 a. Derive relation for Bernoulli's equation. **(6)**

b. Find the ratio of distance travelled by free falling body in first, second and third second. **(4)**

c. If the force of an engine of automobile is doubled with the velocity remaining constant. What happens to its power? **(3)**

Q.4 a. State Doppler effect. Also derive all the solution when apparent frequency of wave decreases than the real frequency. **(7)**

b. A head engine working according to second law of thermodynamics has 50% efficiency. What will be the temperature of its low temperature reservoir if high temperature reservoir is 327°C. **(3)**

c. What happens to the frequency of the mass spring system if length of the spring is cut into one third. **(3)**

Q.5 a. Define centripetal force. Prove that $a_c = \frac{V^2}{r}$. **(6)**

b. If $\vec{A} = 8\hat{\imath} + 6\hat{\jmath}$ makes an angle of 30° with positive *y*-axis then what is the magnitude of its *y*-component. **(3)**

c. Explain how can we obtain plain polarized light? **(4)**

* * * * *

PHYSICS HSSC-I (2nd 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. Derive formulae in simple cases using dimensions.
3. Determine the sum of vectors using perpendicular components
4. Distinguish between positive, negative and zero work with suitable examples
5. State and use of equations of angular motion to solve problems involving rotational motions.
6. Explain that satellites can be put into orbits round the earth because of the gravitational force between the earth and the satellite.
7. Describe that change in entropy is positive when heat is added and negative when heat is removed from the system.
8. Describe practical examples of damped oscillations with particular reference to the efforts of the degree of damping and the importance of critical damping
9. Describe Young's double slit experiment and the evidence it provides to support the wave theory of light.
10. Describe the phenomena of diffraction of X-rays through crystals.
11. Describe the concept of work in terms of the product of force F and displacement d in the direction of force
12. Investigate the fall of spherical steel balls through a viscous medium and determine terminal velocity
13. Describe formation of stationary waves in vibrating air columns.
14. Describe the phenomenon of formation of beats due to interference of non coherent sources.
15. Describe vector product of two vectors in term of angle between them.
16. Manipulate equation of uniformly accelerated motion to solve problems.
17. Define angular displacement, angular velocity and angular acceleration and express angular displacement in radians

SECTION-B

Q.2

i. State SI base units, derived units, and supplementary units for various measurements.

ii. Distinguish between systematic errors (including zero errors) and random errors.

iii. Describe scalar product of two vectors in term of angle between them.

iv. Identify the use of long handle spanner to turn a stubborn bolt.

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

vi. Determine for a projectile launched from ground height.
   1. Launch angle that results in the maximum range.
   2. Relation between the launch angles that result in the same range.

vii. Prove that gravitational field is a conservative field.

viii. Utilize work – energy theorem in a resistive medium to solve problems.

ix. Solve problems by using $S = r\theta$ and $v = r\omega$.

x. Use the formulae of moment of inertia of various bodies for solving problems.

xi. Explain the streamlined designing of racing cars and boats.

xii. Interpret and apply Bernoulli Effect in the: filter pump, Venturi meter, in, atomizers, flow of air over an aerofoil and in blood physics.

xiii. Describe practical examples of free and forced oscillations (resonance).

xiv. Verify that the time period of the simple pendulum is directly proportional to the square root of its length and hence find the value of g from the graph.
xv. Describe what is meant by wave motion as illustrated by vibrations in ropes, springs and ripple tank.
xvi. Describe Young's double slit experiment and the evidence it provides to support the wave theory of light.
xvii. State the necessary conditions to observe interference of light.
xviii. Describe the parts and working of Michleson Interferometer and its uses.
xix. Calculate work done by a thermodynamic system during a volume change.
xx. Explain that the efficiency of a Carnot engine is independent of the nature of the working substance and depends on the temperatures of hot and cold reservoirs.

SECTION-C

Q.3 a. Derive Bernoullie equation in the form $P + \frac{1}{2} \rho v^2 + \rho gh = \text{constant}$ for the case of horizontal tube of flow.
b. Manipulate equation of uniformly accelerated motion to solve problems.
c. Express power as scalar product of force and velocity.

Q.4 a. Explain that Doppler effect is also applicable to e.m. waves.
b. Explain that the efficiency of a Carnot engine is independent of the nature of the working substance and depends on the temperatures of hot and cold reservoirs.
c. Define the terms amplitude, period, frequency, angular frequency and phase difference and express the period in terms of both frequency and angular frequency.

Q.5 a. Derive and use centripetal acceleration $a = r\omega^2$, $a = v^2/r$.
b. Determine the sum of vectors using perpendicular components.
c. Explain how plane polarized light is produced and detected.

PHYSICS HSSC-I (2nd 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(ii)3			2(vii)3	1(6)1 5(a)6	2(xi)3 3(a)6	2 (xiii)3	4(a)7	1 (10)1 2(xvii)3	2(xix)3	39	33.6%
Understanding based	1(2)1 2(i)3	1(3)1 1(15)1 2(iii)3 2(iv)3	1(16)1 2(v)3 3(b)4	1(4)1 1(11)1 3(c)3	1(17)1 2(ix)3	1(12)1 2(x)3 2(xii)3	1(8)1 4(c)3 2(xiv)3	1(14)1 2(xv)3	1(9)1 5(c)4 2(xvi)3	1(7)1	56	48.3%
Application based	1(1)1	5(b)3	2(vi)3	2(viii)3	1(5)1			1(13)1	2(xviii)3	2(xx)3 4(b)3	21	18.1%
Total marks	8	11	11	11	12	16	10	12	15	10	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

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

Version No.			

ROLL NUMBER						

⓪	⓪	⓪	⓪
①	①	①	①
②	②	②	②
③	③	③	③
④	④	④	④
⑤	⑤	⑤	⑤
⑥	⑥	⑥	⑥
⑦	⑦	⑦	⑦
⑧	⑧	⑧	⑧
⑨	⑨	⑨	⑨

⓪	⓪	⓪	⓪	⓪	⓪	⓪
①	①	①	①	①	①	①
②	②	②	②	②	②	②
③	③	③	③	③	③	③
④	④	④	④	④	④	④
⑤	⑤	⑤	⑤	⑤	⑤	⑤
⑥	⑥	⑥	⑥	⑥	⑥	⑥
⑦	⑦	⑦	⑦	⑦	⑦	⑦
⑧	⑧	⑧	⑧	⑧	⑧	⑧
⑨	⑨	⑨	⑨	⑨	⑨	⑨

Answer Sheet No._____

Sign. of Candidate _____

Sign. of Invigilator _____

PHYSICS HSSC–I

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. Which one of the following is a dimensionless quantity?
   A. Stress ◯ B. Energy ◯
   C. Surface tension ◯ D. Strain ◯

2. If a body moves towards Earth under the effect of gravity, neglecting air resistance, its motion is called:
   A. Free fall ◯ B. Gravitational ◯
   C. Parabolic ◯ D. Uniform ◯

3. Which one of the following quantities never change for collision of two bodies in an isolated system?
   A. momentum of each body ◯
   B. K.E of each body ◯
   C. total momentum of the system ◯
   D. total K.E of the system ◯

4. A stone is thrown to perform projectile motion, which one of the following is true for vertical acceleration of stone:
   A. Zero ◯
   B. Constant ◯
   C. Maximum at highest point ◯
   D. Maximum at point of projection ◯

5. Which one of the following is **NOT** unit of work?
   A. Joule ◯ B. Kg.m / s ◯
   C. N.m ◯ D. Ws ◯

6. Increase in the speed of sound in the air per degree rise in temperature is:
   A. 61 ms^{-1} ◯ B. 61 cms^{-1} ◯
   C. 0.61 cms^{-1} ◯ D. 6.1 ms^{-1} ◯

7. For a simple harmonic oscillator, a $= -\omega^2 x$, its frequency is:

A. $2\pi\,\omega$ ◯ B. $\frac{2\pi}{\omega}$ ◯

C. $\frac{\omega}{2\pi}$ ◯ D. $\frac{1}{\omega}$ ◯

8. The expression for orbital velocity is:

A. $v = \sqrt{MGR}$ ◯ B. $v = \sqrt{\frac{GM}{R}}$ ◯

C. $v = \sqrt{\frac{GR}{M}}$ ◯ D. $v = \sqrt{\frac{2GM}{R}}$ ◯

9. Maximum drag force on a falling sphere is 9.8 N, its weight will be:

A. 1 N ◯ B. 9.8 N ◯

C. 19.8 N ◯ D. 4.9 N ◯

10. When length of a simple pendulum is doubled, the ratio of old to new time period will be:

A. 2:1 ◯ B. 1:1 ◯

C. 1:2 ◯ D. $1:\sqrt{2}$ ◯

11. The Stoke's law is valid for:

A. All objects ◯

B. Spherical objects falling at high speed ◯

C. Spherical objects falling at slow speed ◯

D. Cubical objects ◯

12. The locus of all points in a medium having the same phase of vibration is called:

A. Crest ◯ B. Trough ◯

C. Wavelength ◯ D. Wave front ◯

13. Which one is the form of the first law of thermodynamics for isothermal expansion process?

A. Q = W ◯ B. Q = – W ◯

C. W = –ΔU ◯ D. W =ΔU ◯

14. The process in which no heat energy enters or leaves the system is called:

A. Adiabatic process ◯ B. Isothermal process ◯

C. Isobaric process ◯ D. Isochoric process ◯

15. A stone is moving with uniform speed in a vertical circle by mean of a string, the tension in the string will be maximum:

A. At the highest point ◯ B. At the lowest point ◯

C. At horizontal level ◯ D. At every point ◯

16. The moment of inertia of a thin rod of mass "M" and length "L" about its center is:

A. $\frac{1}{2}ML^2$ ◯ B. $\frac{2}{5}ML^2$ ◯

C. $\frac{1}{12}ML^2$ ◯ D. ML^2 ◯

17. If two tuning forks of frequencies f_1 and f_2 are sounded together such that $f_2 > f_1$ then the number of beats per second is:

A. $f_2 - f_1$ ◯ B. $f_2 + f_1$ ◯

C. $f_1 - f_2$ ◯ D. $f_1 + 2f_2$ ◯

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. List applications of moment due to a force.

ii. Show that the equation $v = \sqrt{\frac{TxL}{M}}$ is dimensionally consistent, where v = speed of transverse wave in a stretched string, T= tension in a stretched string, L = length of string and M = mass of string.

iii. How are the cranes able to lift very heavy load without toppling?

iv. Find the angle between two forces of equal magnitude such that the magnitude of their resultant is equal to either of them.

v. Show that the rate of change of momentum is equal to the applied force.

vi. When a driver applies brake suddenly then why does the upper part of the passenger get jerk or move in the forward direction?

vii. Calculate the orbital radius from the centre of the Earth for a Geostationary satellite.

viii. A motorcar is traveling at a speed of $30ms^{-1}$. If the wheel has a diameter of 1.5m, find its angular speed in rad s^{-1} and rev s^{-1}?

ix. Is it possible for a person to distinguish between a raw egg and a hard-boiled egg by spinning each on a table?

x. When a tractor moves with uniform velocity, its larger wheel rotates slowly than its smaller wheel. Why?

xi. What is the function of shock absorber in a car?

xii. (a) For what values of the angle 'θ' between two vectors their scalar product is positive?
(b) For what values of the angle 'θ' between two vectors their scalar product is negative?

xiii. What is the power of an airplane of mass 3000kg, if on a runway it is capable of attaining a speed of $80ms^{-1}$ from rest in 4.0 seconds?

xiv. A source of sound and an observer are moving away from each other. What happens to the apparent pitch heard by the observer?

xv. Why are Polaroid sunglasses better than ordinary sunglasses?

xvi. In Young's double slit experiment the second order maximum occurs at $\theta = 25°$ when the slits are illuminated by light of the wavelength 650nm. Determine the slit separation.

xvii. Why is it not possible to see interference where light beams from head lamps of a car overlap?

xviii. Why do bowlers shine one side of a cricket ball?

xix. Why can efficiency of a thermodynamic system never be 100%?

xx. What length of an open pipe will produce a frequency of 1200Hz as its first overtone on a day when speed of sound is $340ms^{-1}$.

SECTION – C (Marks 26)

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

Q.3 a. Define the molar heat capacity at constant pressure 'C_P' and molar heat capacity at constant volume 'C_v' for a gas. Prove that $C_P - C_v = R$ **(02+04)**

b. 25200J of heat is supplied to the system while the system does 6000J of work. Calculate the change in internal energy of the system. **(04)**

c. Why is it not possible to obtain diffraction of x-rays by Young's double slit experiments? **(03)**

Q.4 a. Define Simple Harmonic Motion (SHM). Show that motion of a simple pendulum is SHM. Also derive an expression for its time period "T". **(02+04)**

b. What should be the length of simple pendulum whose time period is one second? What is its frequency? **(03)**

c. Identify the factors on which speed of sound in air depends. **(04)**

Q.5 a. Using equations of uniformly accelerated motion, determine height, range and time of flight for a projectile. **(02+02+02)**

b. Water flows through a pipe of 1 cm diameter with 1 ms^{-1} speed. What should be the diameter of the nozzle if water is ejecting at an average speed of 2.1 ms^{-1}. **(04)**

c. Why does smoke rise faster in a chimney on a windy day **(03)**

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PHYSICS HSSC-1
MODEL QUESTION PAPER SLOs
(Curriculum 2006)

SECTION-A

Q.1 Choose the correct answer A/B/C/D by filling the relevant bubble for each question.

1. Check the homogeneity of physical equations by using dimensionality and base units.
2. Distinguish between positive and negative acceleration, uniform and variable acceleration.
3. Describe that while momentum of a system is always conserved in interaction between bodies some change in K.E. usually takes place.
4. Communicate the ideas of a projectile in the absence of air resistance that. (i) Horizontal component (VH) of velocity is constant. (ii) Acceleration is in the vertical direction and is the same as that of a vertically free falling object. (iii) The horizontal motion and vertical motion are independent of each other.
5. 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).
6. Identify the factors on which speed of sound in air depends
7. Identify and use the equation; $a = -\omega 2 x$ as the defining equation of SHM.
8. Define the term orbital velocity and derive relationship between orbital velocity, the gravitational constant, mass and the radius of the orbit.
9. Describe that real fluids are viscous fluids.
10. analyze the motion of a simple pendulum is SHM
11. Describe that viscous forces in a fluid cause a retarding force on an object moving through it.
12. State Huygen's principle and use to construct wavefront.
13. Explain that first law of thermodynamics expresses the conservation of energy.
14. Explain that first law of thermodynamics expresses the conservation of energy.
15. describe situations in which the centripetal acceleration is caused by a tension force
16. define moment of inertia of a body
17. Describe the phenomenon of formation of beats due to interference of non-coherent sources.

SECTION-B

Q.2 Attempt FOURTEN parts from following

1. List applications of torque or moment due to a force.
2. Check the homogeneity of physical equations by using dimensionality and base units.
3. Describe how cranes are able to lift heavy loads without toppling.
4. Determine sum of vectors using perpendicular components.
5. Describe the Newton's second law of motion as rate of change of momentum
6. Apply Newton's laws to explain the motion of objects in a variety of context.
7. Describe that communication satellites are usually put into orbit high above the equator and that they orbit the earth once a day so that they appear stationary when viewed from earth.
8. Solve problems by using $S = r\theta$ and $v = r\omega$.

9. Explain conservation of angular momentum as a universal law and describe examples of conservation of angular momentum.
10. Explain conservation of angular momentum as a universal law and describe examples of conservation of angular momentum.
11. Describe practical examples of damped oscillations with particular reference to the efforts of the degree of damping and the importance of critical damping in cases such as a car suspension system.
12. distinguish between positive, negative and zero work with suitable examples
13. Express power as scalar product of force and velocity
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. Identify and express that polarization is produced by a Polaroid.
16. Determine the wavelength of light using diffraction grating.
17. State the necessary conditions to observe interference of light.
18. Describe that the pressure difference can arise from different rates of flow of a fluid (Bernoulli effect).
19. Explain the working principle of Carnot's engine
20. Determine the wavelength of sound in air using stationary waves and calculate speed of sound.

SECTION-C

Q.3 (a) Define specific heat of gas. Apply first law of thermodynamics to derive $C_p - C_v = R$

(b) Apply first law of thermodynamics

(c) State the necessary conditions to observe interference of light.

Q.4 (a+b) analyze the motion of a simple pendulum is SHM and calculate its time period.

(c) Identify the factors on which speed of sound in air depends

Q.5 (a) Evaluate using equations of uniformly accelerated motion that for a given initial velocity of frictionless projectile. 1. How higher does it go? 2. How far would it go along the level land? 3. Where would it be after a given time? 4. How long will it remain in air?

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

(c) Describe that the pressure difference can arise from different rates of flow of a fluid (Bernoulli Effect)

PHYSICS HSSC-I

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		Q 2(i)3	Q 1(2)1 Q 1(3)1 Q 5(a)6	Q 1(5)1	Q 1(16)1 Q 1(8)1		Q 4(a)6	Q1(6)1 Q 4(c)4	Q 1(12)1	Q 3(a)6 Q1(13)1 Q 1(14)1	34	29.3%
Understanding based		Q 2(iv)3 Q 2(iii)3	Q 1(4)1 Q 2(v)3	Q 2(xii)3 Q2(xiii)3	Q 1(15)1 Q 2(vii)3 Q 2(viii)3	Q 1(9)1 Q 1(11)1 Q5(b)4	Q 2(xi)3 Q 4(b)3 Q 1(7)1	Q1(17)1 Q 2(xiv)3 Q 2(xx)3	Q2(xv)3 Q2(xvii)3 Q 3(c)3 Q 2(xvi)3	Q 2(xix)3 Q 3(b)4	62	53.4%
Application based	Q1(1)1 Q2(ii)3		Q 2(vi)3		Q 2(ix)3 Q 2(x)3	Q2(xviii)3 Q5(c)3	Q 1(10)1				20	17.2%
Total marks	4	9	15	7	15	12	14	12	13	15	116	100%

KEY:

1(1)(01)

Question No (Part No.) (Allocated Marks)