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 **A** × **B** = 0 then $\vec{\boldsymbol{B}}$ would be:
A. 4**j** ◯ B. -4**i** ◯
C. -(**i**+**j**) ◯ D. (**j**+**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)**

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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