PHYSICS HSSC-I
SECTION – A (Marks 17)

Note: Section – A is compulsory. All parts of this section are to be answered on the separately provided OMR Answer Sheet which should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

Q. 1 Choose the correct answer A / B / C / D by filling the relevant bubble for each question on the OMR Answer Sheet according to the instructions given there. Each part carries one mark.

1) Signals from remote control to the device operated by it travel with the speed of:
   A. Light   B. Ultrasonic   C. Supersonic   D. Sound

2) The effect produced by the superposition of waves from two coherent sources passing through the same region is called:
   A. Diffraction   B. Interference   C. Polarization   D. Refraction

3) In which of the following processes maximum work can be obtained?
   A. Isochoric   B. Isothermal   C. Adiabatic   D. Isobaric

4) Which of the following may be used as valid formula to calculate speed of ocean waves?
   (v=speed, g=acceleration due to gravity, λ =wavelength, ρ=density, h=depth)

   A. gh/λ B. $\sqrt{\lambda g}$ C. $\dfrac{\lambda}{gh}$ D. $\rho g h$

5) In a cricket match 500 spectators are counted one by one. How many significant figures will be there in the final result?
   A. 1   B. 2   C. 3   D. 0

6) A person walks first 10 km north and 20 km east. The magnitude of the resultant vector is:
   A. 22.36 km   B. 22.46 km   C. 25.23 km   D. 20.36 km

7) For which angle the equation, $\left|\vec{A}.\vec{B}\right| = \left|\vec{A}\times\vec{B}\right|$ is correct:

   A. 45°   B. 60°   C. 90°   D. 0°

8) When a block of wood of mass 2 kg is pushed along a horizontal flat surface of a bench, the force of friction is 4N. When the block is pushed along the bench with a force of 10N, it moves with a constant:
   A. Speed of $5ms^{-1}$ B. Acceleration of $3ms^{-2}$
   C. Acceleration of $5ms^{-2}$ D. Speed of $3ms^{-1}$

9) A projectile is thrown so that it travels a maximum range of 100m. How high will it rise?
   A. 400 m   B. 500 m   C. 1000 m   D. 250 m

10) One horse power is equal to:
    A. 746 Joules   B. 746 KW   C. 746 N   D. 746 Watt

11) What is moment of inertia of a sphere?

    A. $\dfrac{1}{2}M^2R$ B. $\dfrac{2}{5}MR^2$ C. $\dfrac{1}{2}MR^2$ D. MR^2

12) If the earth suddenly stops rotating, the value of 'g' at equator would:
    A. Remain unchanged   B. Increase
    C. Become Zero   D. Decrease

13) A rain drop of radius 'r' falls in air with a terminal speed v_t. What should be the terminal speed of rain drop of radius '2r'?

    A. v_t B. $2v_t$ C. $4v_t$ D. $\dfrac{v_t}{2}$

14) Bernoulli's equation is based upon law of conservation of:
    A. Energy   B. Momentum   C. Current   D. Mass

15) The time period of the same pendulum at Karachi and at Murree are related as: (T_M = Time period at Murree T_K = Time period at Karachi)

    A. $T_K \rangle T_M$ B. $T_K \langle T_M$ C. $2T_K = 3T_M$ D. $T_K = T_M$

16) In an isolated system the total energy of vibrating mass and spring is:
    A. Variable   B. Low   C. High   D. Constant

17) Which of the following factors has no effect on the speed of sound in a gas?
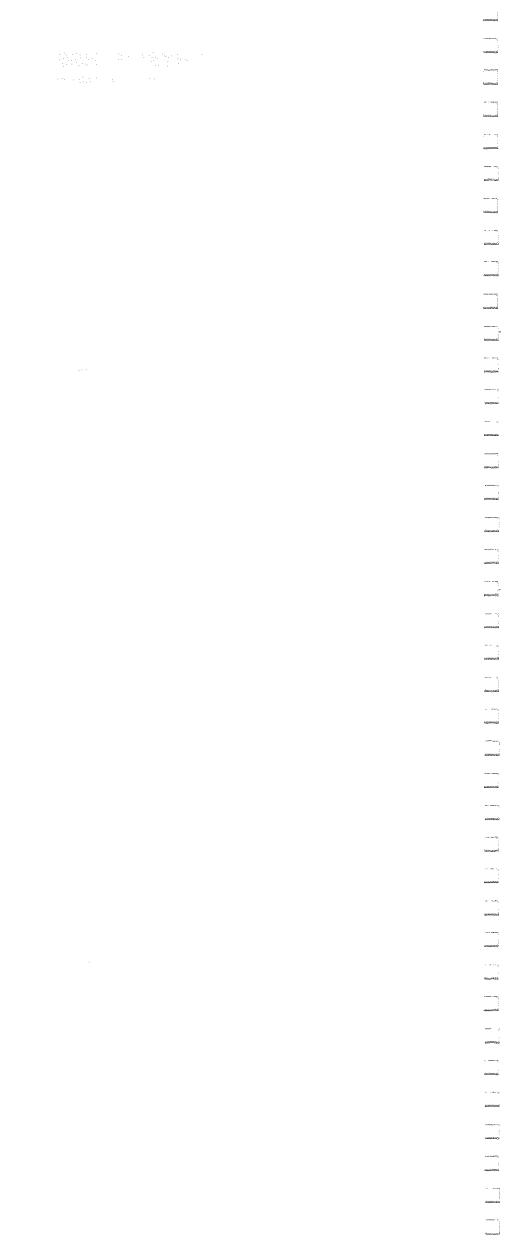   A. Pressure   B. Temperature   C. Density   D. Humidity

PHYSICS HSSC–I

Revised Syllabus

Time allowed: 2:35 Hours   **Total Marks Sections B, C and D: 68**

NOTE: Answer any seven parts each from section B and C and any two questions from section D on the separately provided answer book. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly.

SECTION – B (Marks 21)
(Chapters 1 to 5)

Q. 2   **Answer any SEVEN parts. All parts carry equal marks.**   **(7 x3 = 21)**

(i)   Show that the famous Einstein's equation $E = mc^2$ is dimensionally consistent.

(ii)   What does word "micro" signify in the words "microwave oven"?

(iii)   Write down the steps for addition of vectors by rectangular components method.

(iv)   Explain how cranes are able to lift very heavy load without toppling?

(v)   Aeroplane while horizontally drops a bomb when reaches exactly above the target, but missed it. Explain briefly.

(vi)   State how impulse is related to linear momentum.

(vii)   Show that $W_T = \lim\limits_{\Delta t \to 0} \sum\limits_{i=1}^{n} (F_i \cos\theta_i) \Delta d_i$ for a variable force.

(viii)   Differentiate between Solar energy and Wind energy.

(ix)   Establish a relation between Linear velocity (v) and Angular velocity (w).

(x)   Show that orbital velocity, $v \propto \dfrac{1}{\sqrt{r}}$

SECTION – C (Marks 21)
(Chapters 6 to 10)

Q. 3   **Answer any SEVEN parts. All parts carry equal marks.**   **(7 x3 = 21)**

(i)   What is meant by aerofoils? Explain briefly.

(ii)   How do pulsations in pulse show the heart beat?

(iii)   Differentiate between free and forced oscillations.

(iv)   Give two applications in which resonance plays an important role.

(v)   Why do sound waves travel faster in solids than in gases?

(vi)   What is the difference between progressive and stationary waves?

(vii)   In a Michelson interferometer a second glass plate is also used. Why?

(viii)   What is meant by dual nature of light? Explain briefly.

(ix)   Differentiate between Reversible and Irreversible processes.

(x)   Write the limitations of first law of thermodynamics.

SECTION – D (Marks 26)

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

Q. 4   **a.**   Define projectile motion with figure. Also derive mathematical equations for maximum height attained, time of flight and range of projectile.   **(2+6)**

      b.   A ball of mass 100 g is thrown vertically upward at a speed of $25 ms^{-1}$. If no energy is lost, determine the height it would reach. If the ball only rises to 25 m, calculate the work done against air resistance. Also calculate the force of friction.   **(05)**

Q. 5   **a.**   Derive equations for kinetic and potential energies of a body of mass m executing S.H.M.   **(07)**

      b.   A car is moving at $20 ms^{-1}$ along a straight road with its $500 Hz$ horn sounding. You are standing at the road side. What frequency do you hear as car is:

         (i)   Approaching you   **(ii)**   Receding from you at $20 ms^{-1}$

         (Take speed of sound $= 340 ms^{-1}$)   **(06)**

Q. 6   **a.**   Explain the diffraction of X-rays by crystal and derive an expression for Bragg's Law to find the wavelength of light used.   **(08)**

      b.   A refrigerator has a coefficient of performance 8. If the temperature in the freezer is $-23°C$, what is the temperature at which it rejects heat?   **(05)**

PHYSICS HSSC–I
SECTION – A (Marks 17)

Time allowed: 25 Minutes

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Note: Section – A is compulsory. All parts of this section are to be answered on the separately provided OMR Answer Sheet which should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

Q. 1 Choose the correct answer A / B / C / D by filling the relevant bubble for each question on the OMR Answer Sheet according to the instructions given there. Each part carries one mark.

1) Which of the following is a pair of SI base units?
A. Ampere, Joule
B. Coulomb, Second
C. Kilogram, Kelvin
D. Newton, Meter

2) $\dfrac{1km}{1Gm} = $ _____ ?
A. μ
B. μm
C. $10^{-6}m$
D. $10^{6}m$

3) A person walks first 10 km north and 20 km east. Then the magnitude of resultant vector is:
A. 20.36 km
B. 22.36 km
C. 22.46 km
D. 25.23 km

4) If the scalar product $\vec{A}.\vec{B}=0$, then which of the following is **NOT** correct?

A	B	C	D
$\left|\vec{A}\right|=0$	$\left|\vec{A}\right|\neq 0$	$\left|\vec{A}\right|\neq 0$	$\left|\vec{A}\right|\neq 0$
$\left|\vec{B}\right|\neq 0$	$\left|\vec{B}\right|=0$	$\left|\vec{B}\right|\neq 0$	$\left|\vec{B}\right|\neq 0$
$\theta\neq 0°$	$\theta\neq 0°$	$\theta=0°$	$\theta\neq 0°$
$\cos\theta\neq 0$	$\cos\theta\neq 0$	$\cos\theta\neq 0$	$\cos\theta=0$

5) A car takes 1 hour to travel 100 km along a main road and than ½ hour to travel 20 km along a side road. What is the average speed of the car for the Whole Journey?
A. $60kmh^{-1}$
B. $70kmh^{-1}$
C. $80kmh^{-1}$
D. $100kmh^{-1}$

6) Rate of change of velocity is called:
A. Speed
B. Distance
C. Acceleration
D. Displacement

7) An example of non-conservative force is:
A. Electric force
B. Magnetic force
C. Gravitational force
D. Frictional force

8) The expression for escape velocity is given by:
A. $2gR^{2}$
B. $\sqrt{2gR}$
C. $\dfrac{gR^{2}}{2}$
D. $2gR$

9) Artificial satellites move around:
A. Moon
B. Sun
C. Stars
D. Earth

10) What is the moment of inertia of a solid cylinder?
A. MR^{2}
B. $\dfrac{1}{2}M^{2}R$
C. $\dfrac{2}{5}M^{2}R$
D. $\dfrac{1}{2}MR^{2}$

11) The pressure will be low where the speed of the fluid is:
A. Zero
B. High
C. Low
D. Constant

12) If the period of oscillation of mass (M) suspended from a spring is 2S. then period of mass 4M should be:
A. 1S
B. 2S
C. 4S
D. 8S

13) In an Isolated system the total energy of a vibrating mass and spring is:
A. Constant
B. Variable
C. Low
D. High

14) There is no net transfer of energy by particles of medium in:
A. Longitudinal wave
B. Transverse wave
C. Progressive wave
D. Stationary wave

15) Which of the following factors has no effect on the speed of sound in a gas?
A. Humidity
B. Pressure
C. Temperature
D. Density

16) A real gas can be approximated to an ideal gas at:
A. Low density
B. High pressure
C. High density
D. Low temperature

17) Coloured fringes observed in soap bubbles are the examples of:
A. Diffraction
B. Interference
C. Polarization
D. Reflection

—— 1HA 1908 (ON) ——

PHYSICS HSSC–I
Revised Syllabus

Time allowed: 2:35 Hours   **Total Marks Sections B, C and D: 68**

NOTE: Answer any seven parts each from section B and C and any two questions from section D on the separately provided answer book. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly.

SECTION – B (Marks 21)
(Chapters 1 to 5)

Q. 2   Answer any SEVEN parts. All parts carry equal marks.   **(7 x3 = 21)**

(i)   Define the number π and show that 2π radian $= 360°$.

(ii)   Give the draw backs to use the period of a pendulum as a time standard.

(iii)   Briefly explain how cranes are able to lift very heavy load without toppling?

(iv)   Briefly explain why do buses and heavy trucks have large steering wheels?

(v)   What is head-on collision? Explain briefly with an example.

(vi)   Define elastic and inelastic collisions.

(vii)   Why are energy savers used instead of normal bulbs?

(viii)   Does a hydrogen filled balloon possess any P.E? Explain briefly.

(ix)   Establish a relation between linear acceleration (a) and angular acceleration (α).

(x)   Why is the fly wheel of an engine made heavy in the rim?

SECTION – C (Marks 21)
(Chapters 6 to 10)

Q. 3   Answer any SEVEN parts. All parts carry equal marks.   **(7 x3 = 21)**

(i)   Describe the working of an engine carburettor and paint spray.

(ii)   Smoke rises in a chimney faster when a breeze is blowing. Explain briefly.

(iii)   Is there any connection between 'F' and 'x' in mass spring system? Explain briefly.

(iv)   A singer holding a note of right frequency, can shatter a glass? Explain briefly.

(v)   Is it possible for an object which is vibrating transversely to produce sound waves?

(vi)   Why do sound waves travel faster in the solids than in gases?

(vii)   Can we apply Huygen's principle to radar waves?

(viii)   A soap bubble looks black when it bursts. Why?

(ix)   Write the limitations of first law of thermodynamics.

(x)   Entropy is often called as "time arrow". Explain briefly.

SECTION – D (Marks 26)

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

Q. 4   a.   State and explain Bernoulli's equation. Explain any three applications of Bernoulli's theorem.   **(2+6)**

  b.   What should be the length of simple pendulum whose time period is one second? What is frequency of seconds pendulum?   **(4+1)**

Q. 5   a.   Define and explain absolute potential energy. Prove that absolute $P.E_{abs} = \dfrac{GmM_e}{R_e}$.   **(2+6)**

  b.   A wheel of a machine is rotating at a steady rate of $120 \ rev \ min^{-1}$. Find:
  (i)   Its angular velocity
  (ii) The linear velocity of a point on the wheel at 0.25 m from axle.   **(05)**

Q. 6   a.   Explain polarization of light in detail.   **(08)**

  b.   Calculate the change in entropy when 10 kg of water is heated from $90°C$ to $100°C$? (specific heat of water is $4180 \ J \ mole^{-1}k^{-1}$)   **(05)**

Time allowed: 25 Minutes

Note: Section – A is compulsory. All parts of this section are to be answered on the separately provided OMR Answer Sheet which should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

Q. 1 Choose the correct answer A / B / C / D by filling the relevant bubble for each question on the OMR Answer Sheet according to the instructions given there. Each part carries one mark.

1) In case of grating spectrometer, the resolving power 'R' is given as:

A. $R = \dfrac{\lambda}{\lambda_2 + \lambda_1}$ B. $R = \dfrac{1.22\lambda}{D}$ C. $R = \dfrac{\lambda_2 - \lambda_1}{\lambda}$ D. $R = \dfrac{\lambda}{\Delta\lambda}$

2) The detector in photo-phone is made of:

A. Germanium B. Selenium C. Silicon D. Cadmium

3) No entropy change takes place in an:

A. Adiabatic process B. Isobaric process
C. Isochoric process D. Isothermal process

4) The branch of physics which deals with the structure and properties of solids is called:

A. Nuclear physics B. Solid state physics

C. Atomic physics D. Particle physics

5) The minimum number of unequal forces whose vector sum can be zero is:
A. 2 B. 3 C. 4 D. 1

6) If $\vec{A} \times \vec{B} = \vec{C}$ is directed along positive $Z - axis$, then the vectors $\vec{A}$ and $\vec{B}$ must lie in:

A. ZX-plane B. Vertical plane C. XY-plane D. YZ-plane

7) When a bullet of mass 'm' is fired from a gun of mass 'M' with velocity 'V', then velocity of the gun will be:

A. $V' = -\dfrac{MV}{m}$ B. $V' = -mvt$ C. $V' = -\dfrac{mV}{M}$ D. $V' = -\dfrac{mV}{t}$

8) The maximum height attained by a projectile is:

A. $\dfrac{Vi^2 \sin^2\theta}{2g}$ B. $\dfrac{Vi^2 \cos^2\theta}{g}$ C. $\dfrac{2Vi^2 \sin^2\theta}{g}$ D. $\dfrac{Vi^2 \sin^2\theta}{g}$

9) The work done in moving a body from one place to another in gravitational field is independent of:

A. The applied force B. The path followed by the body

C. The power consumed D. Force of gravity

10) Kilo watt hour is the unit of:

A. Work B. Force C. Momentum D. Power

11) The dimensions of angular velocity are:

A. $\left[LT^{-2}\right]$ B. $\left[L^{-1}T\right]$ C. $\left[T^{-1}\right]$ D. $\left[LT^{-1}\right]$

12) The S.I unit of flow rate is:
A. $m^3 s^{-2}$ B. $m^3 s^{-1}$ C. $m^2 s^{-2}$ D. $m^2 s^{-1}$

13) The fundamental equation in fluid dynamics that relates pressure to fluid speed and height is:

A. Bernoulli's equation B. Stoke's equation
C. Mass-energy equation D. Equation of continuity

14) The angular velocity of the mass attached to a spring is:

A. $\omega = 2\pi\sqrt{\dfrac{m}{K}}$ B. $\omega = \sqrt{\dfrac{m}{K}}$ C. $\omega = 2\pi\sqrt{\dfrac{K}{m}}$ D. $\omega = \dfrac{1}{2\pi}\sqrt{\dfrac{m}{K}}$

15) Acceleration of a mass-spring system is:

A. Variable due to change in direction only
B. Variable due to change in magnitude only
C. Variable due to change in direction and magnitude
D. Uniform

16) Under stationary waves set up in a medium, the nodes are located at : (Where $n = 1,2,3,.......$)

A. $\dfrac{n\lambda}{4}$ B. $\dfrac{n\lambda}{2}$ C. $(2n+1)\dfrac{\lambda}{2}$ D. $(n+1)\dfrac{\lambda}{4}$

17) When light passes through a pin hole type opening, it seems to spread out. This phenomenon is known as:
A. Reflection B. Diffraction C. Polarization D. Dispersion

PHYSICS HSSC–I
(Old Syllabus)

Time allowed: 2:35 Hours   **Total Marks Sections B, C and D: 68**

NOTE: Answer any seven parts each from section B and C and any two questions from section D on the separately provided answer book. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly.

SECTION – B (Marks 21)
(Chapters 1 to 6)

Q. 2   Answer any SEVEN parts. All parts carry equal marks.   **(7 x3 = 21)**

(i)   Under what conditions zeros are **NOT** significant figures?

(ii)   How would the two vectors of the same magnitude have to be oriented, if they were to be combined to give a resultant equal to a vector of the same magnitude?

(iii)   Can a body be in equilibrium under the action of a single force?

(iv)   A Ghauri missile is fired at an angle of 90° with horizontal axis with a velocity of $300ms^{-1}$. Find the time for which the missile remains in air.

(v)   What happens when a very heavy ball collides with a light stationary ball?

(vi)   In which case is more work done? When 50kg bag of books is lifted through 50cm, or when a 50kg crate is pushed through 2m across the floor with a force of 50N?

(vii)   A diver of 50g mass dives from a 10m high diving board in a swimming pool. Calculate its P.E. before jump.

(viii) a.   What is meant by angular momentum?

        b.   Explain the law of conservation of angular momentum.

(ix)   The cylinders A and B are of the same mass but the radius of A is greater than that of B. Which one will require more force to come into rotation? And why?

(x)   What is Venturi's effect? Write its equation.

SECTION – C (Marks 21)
(Chapters 7 to 11)

Q. 3   Answer any SEVEN parts. All parts carry equal marks.   **(7 x3 = 21)**

(i)   a.   What is meant by phase angle?

        b.   Does the phase angle define angle between maximum displacement and the driving force.

(ii)   Time period of a mass-spring system is given by $T = 2\pi\sqrt{\dfrac{m}{K}}$. If '$x$' is the extension from mean position, what would be the time period in terms of extension 'x'?

(iii)   Write three characteristics of stationary waves.

(iv)   Explain three uses of Doppler's effect.

(v)   State Huygen's principle.

(vi)   What is Bragg's equation? Describe its two applications.

(vii)   In a compound microscope, magnification produced by objective lens is 5 and that produced by eye-piece is 50. What is the total magnification produced by the microscope.

(viii) How is power lost in optical fibre through scattering and absorption?

(ix)   Find the average speed of an oxygen molecule in the air at S.T.P.

(x)   336 J of energy is required to melt 1g of ice at $0°C$. What is the change in entropy of 30g of water at $0°C$ as it is changed to ice at $0°C$ by a refrigerator?

SECTION – D (Marks 26)

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

Q. 4 **a.** Define and explain scalar product of two vectors with example. Show that the scalar product is

commutative with the help of a figure. Describe its three characteristics. **(2+2+2)**

b. A load of 10N is suspended from a clothes line. This distorts the line so that it makes an angle

of $15°$ with the horizontal at each end. Find the tension in the clothes line. **(04)**

c. Explain the phenomenon of error and uncertainty in measurements. **(03)**

Q. 5 **a.** Prove that the work done in a gravitational field is independent of the path followed by the body

and along closed path is zero. **(3+3)**

b. A force of 400 N is required to overcome road friction and air resistance in propelling an

automobile at $80 Kmh^{-1}$. What power in KW must the engine develop? **(04)**

c. Write a note on momentum and explosive forces. **(03)**

Q. 6 **a.** Describe the diffraction of X-rays by crystals and obtain Bragg's equation. Write its two uses. **(2+2+2)**

b. Sodium light $(\lambda = 589nm)$ is incident normally on a grating having 3000 lines per centimetre.

What is the highest order of the spectrum obtained with this grating? **(04)**

c. Describe the construction and working of a spectrometer. **(03)**

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Page 2 of 2 (Physics)