Physics

H.S.S.C (11th) 1st Annual 2023   Time : 20 Minutes

Paper : I | Group : I | Objective – (iv)   Marks : 17

Paper Code | 6 | 4 | 7 | 7 |

CANCELLED

Note: - You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number in your answer book. Use marker or pen to fill the circles. Cutting or filling up two or more circles will result no mark.

SECTION-A

Q.1	Questions	A	B	C	D
1.	2° is equal to:	0.035 rad.	0.300 rad.	0.350 rad.	0.0035 rad.
2.	Which electromagnetic wave is used for the satellite communication system?	Radio waves	Infrared waves	Ultraviolet waves	Microwaves
3.	An electric motor produces a tension of 4500N in a load lifting cable and rolls it at the rate of $2ms^{-1}$. The power of the motor is:	4kW	2kW	15kW	9kW
4.	Acceleration of rocket is given by relation:	$a=\dfrac{M}{mv}$	$a=\dfrac{m}{Mv}$	$a=\dfrac{mv}{m}$	$a=\dfrac{mv}{M}$
5.	If $1\vec{a}+\vec{b}1=1\vec{a}-\vec{b}1$ then angle between $\vec{a}$ and $\vec{b}$ is:	0°	45°	90°	180°
6.	Two forces of magnitudes 10N and 20N act on a body in directions making angles of 30° each with x-axis. The x-component of the resultant force will be:	25.98 N	30.98 N	20.98 N	17.98 N
7.	Speed of the earth around the sun in ms^{-1} is:	35500	20000	29600	50000
8.	Which pair of physical quantities have same dimensions?	Work and power	Momentum and impulse	Force and torque	Momentum and force
9.	Velocity of an object has 1% uncertainty and mass has 2% uncertainty then total uncertainty in K.E will be:	3%	2%	4%	1%
10.	Absolute zero corresponds to:	−459ºF	−360ºF	0ºF	460ºF
11.	The change in internal energy is defined as:	Q − T	Q + P	Q − P	Q − W
12.	The refractive index of water is 1.33 the speed of light in water is: (c = 3×10^8m/sec)	3×10^8m/sec	1.8×10^8m/sec	2.3×10^8m/sec	1.3×10^8m/sec
13.	In Michelson interferometer, to switch the fringes from bright to dark, the mirror should be displaced by:	$\dfrac{\lambda}{2}$	$\dfrac{\lambda}{3}$	$\dfrac{\lambda}{4}$	λ
14.	Speed of sound at 0^oC is 332 ms^{-1}. The speed of sound at 30^oC will be:	332 m/sec	350 m/sec	340 m/sec	335 m/sec
15.	A block weighing 4.0 kg extends a spring by 0.16m from its unstretched position, stretching force is:	20.3 N	16.3 N	39.2 N	14.2 N
16.	A simple harmonic oscillator has a period of 0.01s and an amplitude of 0.2m. The magnitude of velocity at the centre of oscillation is:	20π	40π	60π	80π
17.	The dimensions of $\dfrac{1}{2}\rho V^2$ is same as that of:	K.E	P.E	Pressure	Work

Physics

H.S.S.C (11th) 1st Annual 2023   Time : 2:40 Hours

| Paper : I | Group : I | Subjective | Marks : 68 |

Note: Section **B** is compulsory. Attempt any **Three** questions from Section **C**.

SECTION–B

2. **Write short answers to any Eight parts.** (8 x 2 = 16)

i. Distinguish between base units and derived units.
ii. What are random error and systematic error?
iii. Write the dimensions of: (i) Pressure (ii) Power.
iv. The period of a simple pendulum is measured by a stop watch. What type of errors are possible in the time period?
v. Define: (i) Null vector (ii) Equal vectors.
vi. Vector $\vec{A}$ lies in the xy-plane. For what orientation will both of its rectangular components be negative? For what orientation will its components have opposite signs?
vii. Can a vector have component greater than the vector's magnitude?
viii. Water flows out from a pipe at $3 \, kg \, s^{-1}$ and its velocity changes from $5 \, ms^{-1}$ to zero on striking the wall. What will be the force exerted by water on the wall?
ix. Derive formula for time of flight of projectile.
x. What is the difference between elastic and inelastic collision?
xi. What is the difference between uniform and variable velocity?
xii. Two row boats moving parallel in the same direction are pulled towards each other. Explain.

3. **Write short answers to any Eight parts.** (8 x 2 = 16)

i. A girl drops a cup from a certain height which breaks into pieces. Which energy changes are involved?
ii. In which case more work is done? When a 50 kg bag of books is lifted through 50cm or when a 50 kg crate is pushed through 2m across a force of 50N?
iii. Potential energy is the property of a conservative field. Explain.
iv. What is geostationary satellite and geo-stationary radius?
v. Show that orbital angular momentum $L_o = mvr$.
vi. What is meant by moment of inertia? Explain its significance.
vii. If a mass spring system is hung vertically and set into oscillation, why does the motion eventually stop?
viii. Show that when a pendulum moves from mean position to half of amplitude, time taken by it is $t = \dfrac{T}{12}$.
ix. What is meant by phase angle?
x. Explain 'red shift' and 'blue shift' in light.
xi. Why does sound travel faster in solids than in gases?
xii. How are beats useful in tuning musical instruments?

4. **Write short answers to any Six parts.** (6 x 2 = 12)

i. State Huygen's principle.
ii. How would you manage more orders of spectra by using a diffraction grating?
iii. How is the distance between interference fringes affected by the separation between the slits of Young's experiment? Can fringes disappear?
iv. What is the least distance of distinct vision? Also, give the length of this distance.
v. If a person was looking through a telescope at the full moon, how would the appearance of the moon be changed by covering half of the objective lens?
vi. What is the average translational K.E of molecules in a gas at temperature $27^{o}C$?
vii. How would you explain the sign convention of First Law of Thermodynamics?
viii. Why is the average velocity of the molecules in a gas zero but the average of the square of velocities is not zero.
ix. Why does the pressure of a gas in a car tyre increase when it is driven through some distance?

SECTION–C

(Note: Attempt any Three questions. Each question carries Eight (8) Marks) (8x3=24)

5. (a) What is gravitational field? Show that gravitational field is a conservative field. (5)
   (b) Find the projection of vector $\vec{A} = 2\hat{i} - 8\hat{j} + \hat{k}$ in the direction of the vector $\vec{B} = 3\hat{i} - 4\hat{j} - 12\hat{k}$. (3)

6. (a) State and prove the law of conservation of linear momentum. (5)
   (b) A body of moment of inertia $I = 0.80$ kg m^2 about a fixed axis, rotate with a constant angular velocity of 100 rad s^{-1}. Calculate its angular momentum and the torque to sustain this motion. (3)

7. (a) State and prove Bernoulli's equation for an ideal fluid. (5)
   (b) A carnot engine whose low temperature reservoir is at 7°C has an efficiency of 50%. It is desired to increase the efficiency to 70%. By how many degrees the temperature of the source be increased? (3)

8. (a) Define simple harmonic motion. Discuss that energy is conserved for a body executing simple harmonic motion. (5)
   (b) Find the temperature at which the velocity of sound in air is two times its velocity at 10°C. (3)

9. (a) Describe how Michelson measured the speed of light? (5)
   (b) In a double slit experiment the second order maximum occurs at θ =0.25°. The wavelength is 650 nm. Determine the slit separation. (3)

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Note: - You have four choices for each objective type question as A, B, C and D. The choice which you think is correct; fill that circle in front of that question number in your answer book. Use marker or pen to fill the circles. Cutting or filling up two or more circles will result no mark.

SECTION–A

CANCELLED

Q.1	Questions	A	B	C	D
1.	If a gymnast sitting on a stool with his arm stretched, lowers his arms:	ω decreases	ω increases	I increases	ω remains same
2.	Angular momentum has the same unit as:	Impulse $\times$ Distance	Power $\times$ Time	Linear momentum	Work $\times$ Frequency
3.	Which of the given variable is present in all equations of motion:	Distance	Acceleration	Time	Torque
4.	At what speed, the momentum and kinetic energy of a body have the same value:	$1ms^{-1}$	$2ms^{-1}$	$4ms^{-1}$	$8ms^{-1}$
5.	The earth receives larger amount of energy from:	Wind	Water	Sun	Moon
6.	Product $\hat{i} \times (\hat{j} \times \hat{k})$ is equal to:	1	$\vec{0}$	$\hat{j}$	$\hat{i}$
7.	Projection of $\vec{A}$ on $\vec{B}$ is:	$A\cos\theta$	$B\sin\theta$	$B\tan\theta$	$A\sin\theta$
8.	Absolute uncertainty in a measuring instrument is equal to:	Least count	Accuracy	Fractional uncertainty	Percentage uncertainty
9.	The dimensional formula for the quantity light year is:	[T]	[L]	$[LT^{-1}]$	$[M^{0}LT]$
10.	No entropy change takes place in:	Isobaric process	Isothermal process	Adiabatic process	Isochoric process
11.	If heat is added to a system, then its entropy will:	Increase and positive	Decrease and positive	Increase but negative	Decrease but negative
12.	Information carrying capacity of an optical fibre is called:	Capacity	Band width	Immunity	Ability
13.	Newton's rings are formed due to:	Diffraction	Refraction	Reflection	Interference
14.	Beats can be heard when difference of frequency is not more than:	4 Hz	6 Hz	8 Hz	10 Hz
15.	With the increase of temperature, speed of sound:	Remains same	Becomes zero	Decreases	Increases
16.	Which expression is correct for time period of simple pendulum?	$T \propto l$	$T \propto \sqrt{l}$	$T \propto m$	$T \propto g$
17.	The working of carburetor of car uses:	Equation of continuity	Gravitational law	Stoke's law	Bernoulli's theorem

Note: Section **B** is compulsory. Attempt any **3** questions from Section **C**.

SECTION–B

2. Write short answers to any Eight parts. $(8 \times 2 = 16)$
   i.   Show that $E=mc^2$ is dimensionally consistent.
   ii. The time of 30 vibrations of a simple pendulum recorded by a stop watch accurate up to one tenth of a second is 54.6 s. Find its period with uncertainty.
   iii. Give the drawbacks to use the period of a pendulum as a time standard.
   iv. What is the difference between kilogram and mole?
   v.   Can the product of two vectors be equal to the product of their magnitudes?
   vi. Define the terms (i) unit vector and (ii) components of a vector.
   vii. If $\vec{A} + \vec{B} = \vec{O}$, what can you say about the components of the two vectors?
   viii. Define impulse and write its units.
   ix. Show that the range of projectile is maximum when projectile is thrown at an angle of 45^0 with the horizontal.
   x.   Can the velocity of an object reverse the direction when acceleration is constant? If so give an example.
   xi. Derive the relation for the time of flight of a projectile.
   xii. Explain, how the swing is produced in a fast moving cricket ball.

3. Write short answers to any Eight parts. $(8 \times 2 = 16)$
   i.   A boy uses a catapult to throw a stone which accidentally smashes a greenhouse window. List the possible energy changes.
   ii. An object has 1 J of potential energy. Explain what does it mean?
   iii. What do you know about geothermal energy?
   iv. Why does a diver change his body positions before and after diving in the pool?
   v.   Show that orbital angular momentum $L_o = mvr$.
   vi. What is INTELSAT VI?
   vii. If a mass spring system is hung vertically and set into oscillations, why does the motion eventually stop?
   viii. What is meant by phase angle? Does it define angle between maximum displacement and the driving force?
   ix. Define restoring force. What are its units?
   x.   How should a sound source move with respect to an observer so that the frequency of its sound does not change?
   xi. Why does sound travel faster in solids than in gases?
   xii. How are beats useful in tuning musical instruments?

4. Write short answers to any Six parts. $(6 \times 2 = 12)$
   i.   In Young's experiment, one of the slits is covered with blue filter and other with red filter. What would be the pattern of light intensity on the screen?
   ii. How would you distinguish between un-polarized and plane-polarized lights?
   iii. Give two uses of Michelson's interferometer.
   iv. If a person was looking through a telescope at the full moon, how would the appearance of the moon be changed by covering half of the objective lens?
   v.   What is spectrometer? Write down its two main parts.
   vi. Given an example of a natural process that involves an increase in entropy.
   vii. What happens to the temperature of a room, when an air conditioner is left running on a table in the middle of the room?
   viii. Define Iso-thermal process and write its relation.
   ix. In which process external work is done at the expense of the internal energy of the gas molecules? Explain it.

SECTION–C

(Note: Attempt any Three questions. Each question carries Eight (8) Marks) $(8 \times 3 = 24)$

5. (a) Define gravitational field. Show that work done in gravitational field is independent of path followed. **5**
   (b) Two forces of magnitude 10 N and 20 N act on a body in directions making angles 30° and 60° respectively with x-axis. Find the resultant force. **3**

6. (a) What is projectile and projectile motion? Explain and analyse the oblique projectile as well as horizontal projectile. **5**
   (b) What is the least speed at which an aeroplane can execute a vertical loop of 1.0 km radius so that there will be no tendency for the pilot to fall down at the highest point. **3**

7. (a) Show that pressure exerted by the gas molecules is directly proportional to average translational kinetic energy of the gas molecules. **5**
   (b) Water flows through a hose, whose internal diameter is 1 cm at a speed of 1 ms^{-1}. What should be the diameter of the nozzle if water is to emerge at 21 ms^{-1}? **3**

8. (a) What is the main purpose of resonance? Explain it with an experiment of pendulums of different lengths. Also, give one example of resonance. **5**
   (b) A stationary wave is established in a string which is 120 cm long and fixed at both ends. The string vibrates in four segments at a frequency of 120 Hz. Determine its wavelength and the fundamental frequency? **3**

9. (a) What is a compound microscope? Describe its construction and working. Also calculate its magnifying power. **5**
   (b) A light is incident normally on a grating which has 2500 lines per centimetre. Compute the wavelength of a spectral line for which the deviation in second order is 15.0°. **3**

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