PHYSICS   TIME: 20 MINTUES

GROUP : FIRST *DGK-11-1-23* **OBJECTIVE**   MARKS : 17

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. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question.

QUESTION NO. 1

1	If the radius of a sphere $r = 2.25 \pm 0.01$ cm then percentage uncertainty in r is
	(A) 0.2 % (B) 0.4 % (C) 0.1 % (D) 0.3 %
2	If we add the numbers 2.7543 , 4.10, 1.273, the rounded off answer will be
	(A) 8.1273 (B) 8.127 (C) 8.2 (D) 8.13
3	The minimum number of unequal vectors whose sum can be zero is
	(A) 1 (B) 2 (C) 3 (D) 4
4	The magnitude of resultant of two forces 6N and 8N acting at right angle to each other is
	(A) 10 N (B) 2 N (C) 14 N (D) 8 N
5	The horizontal range and maximum range of projectile are related as
	(A) $R = R_{max} \sin \theta$ (B) $R = R_{max} \sin 2\theta$
	(C) $R = R_{max} \sin^2\theta$ (D) $R = R_{max} \sin \theta \cos \theta$
6	A body is moving with uniform velocity. Its _____ changes
	(A) Speed (B) Acceleration (C) Direction of motion (D) Displacement
7	Escape velocity from the earth surface is
	(A) 4.2 kms^{-1} (B) 7.5 kms^{-1} (C) 9.5 kms^{-1} (D) 11.2 kms^{-1}
8	Which of the following is correct
	(A) $\vec{v} = \vec{r} \times \vec{w}$ (B) $\vec{v} = \vec{w} \times \vec{r}$ (C) $\vec{v} = \vec{r}.\vec{w}$ (D) $\vec{v} = \vec{w}.\vec{r}$
9	The internal energy of 1 mole of an ideal gas depends on
	(A) Volume (B) Pressure (C) Temperature (D) Potential energy
10	The number of geo – stationary satellites to cover the whole earth is
	(A) 5 (B) 24 (C) 3 (D) 7
11	Cloud formation in the atmosphere is _____ process
	(A) Adiabatic (B) Isobaric (C) Isothermal (D) Isochoric
12	Terminal velocity is a _____ velocity
	(A) Constant maximum (B) Constant minimum (C) Variable (D) Instantaneous
13	Time period of simple pendulum at the centre of the earth will be
	(A) Zero (B) Infinite (C) Same as on the surface of the earth (D) Doubled
14	Maximum number of beats frequency that can be heard by a human is
	(A) 15 Hz (B) 20 Hz (C) 10 Hz (D) 8 Hz
15	Stationary waves are set up in an open organ pipe of length 2m. The wavelength of waves in first mode of vibration is
	(A) 4 m (B) 1 m (C) 8 m (D) 3 m
16	Light waves cannot be polarized by
	(A) Selective absorption (B) Reflection at large incidence angle
	(C) Interference of light (D) Scattering by air molecules.
17	Which of the following phenomena does not occur in sound waves ?
	(A) Diffraction (B) Polarization (C) Interference (D) Reflection

QUESTION NO. 2   Write short answers of any Eight (8) parts of the following   16

i	Differentiate between random and systematic error.
ii	What are two principal characteristics of an ideal standard ?
iii	Why do we find it useful to have two units for the amount of substance Kilogram and the mole?
iv	Show that the famous " Einstein equation " $E = mc^2$ is dimensionally consistent.
v	Prove that scalar product is commutative.
vi	Find the projection of $\vec{A} = 2\hat{\imath} - 8\hat{\jmath} + \hat{k}$ in the direction of $\vec{B} = 3\hat{c} - \hat{\jmath} - 12\hat{k}$
vii	Show that the sum and difference of two perpendicular vectors of equal lengths are also perpendicular and of the same length.
viii	Calculate the distance covered by a free falling body during first second of its motion.
ix	What are inertial and non inertial frame of references.
x	Explain the circumstances in which the velocity V and acceleration a of a car are (a) V is zero but a is not zero. (b) a is zero but V is not zero
xi	At what point or points in its path does a projectile have its minimum speed its maximum speed ?
xii	Explain how swing is produced in a fast moving cricket ball.

QUESTION NO. 3   Write short answers of any Eight (8) parts of the following   16

i	Calculate the work done in Kilo joules in lifting a mass of 10 kg (at a steady velocity) through a vertical height of 10 m.
ii	When a rocket re-enters the atmosphere, its nose cone becomes very hot. Where does this heat energy come from ?
iii	Define term " Aquifer " .
iv	Show that orbital angular momentum $L_o = mv_o r$
v	Explain how many minimum numbers of geo-stationary satellites are required for global coverage of T.V transmission.
vi	Prove that 2 radian = 114.6^o
vii	Name two characteristics of simple harmonic motion.
viii	What is the total distance travelled by an object moving with S.H.M in a time equal to its period, if its amplitude is A ?
ix	Define resonance and give its example.
x	Is it possible for two identical waves travelling in the same direction along a string to give rise a stationary wave.
xi	Why does sound travel faster in solids than in gasses ?
xii	What is condition for path difference in constructive interference and write its general equation ?

QUESTION NO. 4   Write short answers of any Six (6) parts of the following   12

i	State the Huygen's principle.
ii	How would you distinguish between un-polarized and plane-polarized lights ?
iii	An oil film spreading over a wet path shows colours. Explain how does it happen ?
iv	What is the function of a collimator in spectrometer ?
v	How would it be advantageous to use blue light with a compound microscope ?
vi	How can the efficiency of a practical heat engine be increased ?
vii	Why spark plug is not needed in a diesel engine ?
viii	Specific heat of a gas at constant pressure is greater than specific heat at constant volume why ?
ix	Does the entropy of a system increase or decrease due to friction ?

SECTION – II

NOTE : Attempt any three questions from this section   (8 x 3 = 24)   (Part A = 5 marks & Part B = 3 marks)

Q. No.5 (A)	Explain the scalar product with its characteristics and examples.
(B)	How large force is required to accelerate an electron (m = $9.1 \times 10^{-31} kg$) from rest to a speed of $2.0 \times 10^7 \, ms^{-1}$ through a distance of 5.0 cm.
Q. No.6 (A)	Define centripetal force and derive its formula $Fc = \dfrac{mv^2}{r}$
(B)	A football is thrown an angle of 30° with respect to horizontal to throw a 40m pass, What must be the initial speed of the ball.
Q. No.7 (A)	State and explain equation of continuity.
(B)	What is the average translational kinetic energy of molecules in a gas at temperature $27C^o$?
Q. No.8 (A)	Discuss the effects of variations of pressure, density and temperature on the speed of sound in a gas. Also, derive the relation $V_t = V_o + 0.61\, t$
(B)	A simple pendulum is 50.0 cm long. What will be its frequency of vibration at a place where g = 9.8ms^{-2}
Q. No.9 (A)	What is a spectrometer ? Explain its main parts.
(B)	A light is incident normally on a grating which has 2500 lines per centimeter. Compute the wave length of a spectral line for which the deviation in second order is 15.0^o

PHYSICS
GROUP : SECOND OGR-11-2-23 **OBJECTIVE**

TIME: 20 MINTUES
MARKS : 17

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. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question.

QUESTION NO. 1

1	The expression for the time period of low flying satellite put into the orbit is
	(A) $T = \frac{2\pi R}{g}$ (B) $T = \frac{2\pi R}{g^2}$ (C) $T = \frac{2\pi g}{R}$ (D) $T = \frac{2\pi R}{V}$
2	The incompressible and non viscous fluid is called
	(A) Viscous fluid (B) Non ideal fluid (C) Real Fluid (D) Ideal fluid
3	The product of frequency and time period is equal to
	(A) 1 (B) 2 (C) 3 (D) 4
4	The portion of a wave below the mean level is called
	(A) Crest (B) Trough (C) Node (D) Anti - node
5	When an aero plane move towards air port, then its frequency received by radar
	(A) Decreases (B) Increases (C) Remain same (D) Become zero
6	Which of the following waves cannot be polarized
	(A) X - rays (B) radio waves (C) Ultra – violet waves (D) Sound waves
7	The magnifying power of a simple microscope is
	(A) $M = 1 + \frac{f}{d}$ (B) $M = 1 + \frac{d}{f}$ (C) $M = 1 + \frac{1}{f}$ (D) $M = 1 + df$
8	Charle's law can be written as mathematically
	(A) $V \propto T$ (B) $V \propto \frac{1}{T}$ (C) $P \propto T$ (D) $P \propto \frac{1}{T}$
9	The carnot cycle can be shown by
	(A) $V - T$ graph (B) $P - V$ graph (C) $P - T$ graph (D) $P - V - T$ graph
10	The unit of power in terms of base unit is
	(A) $Kg\,ms^{-2}$ (B) $Kg\,m^{-1}s^{-1}$ (C) $Kg\,m^{-2}s^{-2}$ (D) $Kg\,m^2s^{-3}$
11	Time taken by light to reach from sun to earth is
	(A) 1 min, 20 sec (B) 4 min, 20 sec (C) 8 min, 20 sec (D) 10 min, 20 sec
12	$\vec{r} = a\hat{\imath} + b\hat{\jmath} + C\hat{k}$
	(A) Equal vector (B) Position vector (C) Unit vector (D) Negative vector
13	Torque has maximum value if angle between $\vec{r}$ and $\vec{F}$ is
	(A) 30° (B) 90° (C) 45° (D) 60°
14	The time rate of change of displacement is called
	(A) Acceleration (B) Velocity (C) Speed (D) Average force
15	The relation $I = \vec{F} \times \Delta t$ shows
	(A) Momentum (B) Power (C) Impulse (D) Work
16	The original source of energy of tides is
	(A) Earth (B) Sun (C) Moon (D) Star
17	Angular momentum of a body under a centripetal force is
	(A) Zero (B) Maximum (C) Minimum (D) Constant

QUESTION NO. 2 Write short answers of any Eight (8) parts of the following 16

i	Add the given masses, in kg up to appropriate precision 2.189, 0.089, 11.8 and 5.32
ii	How many nano-seconds in one year ?
iii	Why do we find it useful to have two units for the amount of substance, the Kilogram and the mole ?
iv	Write the dimensions of (i) Pressure (ii) Density
v	Can the magnitude of a vector have a negative value ?
vi	Is it possible to add $2\vec{A}$ into 6 ? Explain
vii	Name the three conditions that could make $A_1 \times A_2 = 0$
viii	At the highest point in the path of a projectile its speed is minimum, why? Explain it.
ix	Derive the relation for the height of a projectile.
x	Motion with constant velocity is a special case of motion with constant acceleration. Is this statement true ? Discuss.
xi	Explain the circumstances in which the velocity ' $\vec{v}$ ' and acceleration ' $\vec{a}$ ' of a car are (i) Parallel (ii) Perpendicular to one another
xii	Two row boats moving parallel in the same direction are pulled towards each other. Explain.

QUESTION NO. 3 Write short answers of any Eight (8) parts of the following

i	A person holds a bag of groceries while standing still, talking to a friend. A car is still while its engine is running. From the stand point of work , How are these two situations similar ?
ii	Calculator the work done in Kilojoules in lifting a mass of 10 kg (at a steady velocity) through a vertical height of 10 m.
iii	Define escape velocity. Does the escape velocity of a body depend upon its mass ?
iv	Calculate the rotational K.E of a disc and a hoop
v	Differentiate between tangential and angular velocity. If one of these is given for a wheel of known radius, how will you find the other ?
vi	What is meant by moment of inertia ? Explain its significance.
vii	Name the two characteristics of simple harmonic motion.
viii	Does frequency depend on amplitude for harmonic oscillators ? Explain.
ix	Explain briefly the example of an electrical resonance.
x	Find the temperature at which the velocity of sound in air is two times its velocity at $10\,^{\circ}C$
xi	What features do longitudinal waves have in common with transverse waves ?
xii	Is it possible for two identical waves travelling in the same direction along a string to give rise to a stationary wave ? Explain.

QUESTION NO. 4 Write short answers of any Six (6) parts of the following

i	Draw the experimental arrangement for observing Newton's ring.
ii	How would you manage to get more orders of spectra using a diffraction grating ?
iii	Why the Polaroid sunglasses are better than ordinary sunglasses ?
iv	Define near point and resolving power.
v	Why would it be advantageous to use blue light with a compound microscope ?
vi	What is heat engine ? Define efficiency.
vii	Explain bicycle pump as an example of Ist law of thermodynamics.
viii	Is it possible to convert internal energy into mechanical energy ? Explain with examples.
ix	A thermos flask containing milk as a system is shaken rapidly. Does the temperature of milk rise ?

SECTION – II

NOTE : Attempt any three questions from this part (8 x 3 =24) (Part A = 5 marks and Part B = 3 marks)

Q. No.5 (A)	Define absolute potential energy. Derive relation for absolute potential energy of body of mass 'm' at distance ' r ' from the centre of earth.
(B)	Find the angle between the two Vectors $\vec{A} = 5\,\hat{\imath} + \hat{\jmath}$ and $\vec{B} = 2\,\hat{\imath} + 4\,\hat{\jmath}$
Q. No.6 (A)	What is projectile motion? Work out expressions for (i) Height (ii) Time of light
(B)	A gramophone record turntable accelerates from rest to an angular velocity of 45.0 rev min^{-1} in 1.60 s. What is its average angular acceleration ?
Q. No.7 (A)	Derive a relation which shows that flow rate is a constant quantity in an ideal fluid.
(B)	A thermodynamic system undergoes a process in which its internal energy decreases by 300 J. If at the same time 120 J of work is done on the system, find the heat lost by the system.
Q. No.8 (A)	Define and explain the phenomenon of beats. How beats are graphically represented. Also mention the uses of beats.
(B)	A simple pendulum is 50.0 cm long. What will be its frequency of vibration at a place where g = 9.8 ms^{-2}
Q. No.9 (A)	What is compound microscope ? Explain its working and derive the formula for its angular magnification
(B)	In a double slit experiment the second order maximum occurs at $\theta = 0.25°$. The wavelength is 650 nm. Determine the slit separation.