

D

PHYSICS

GROUP : FIRST

TIME: 20 MINUTES

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 Number of colours used in process of colour printing to produce the entire range of colours are
(A) 4 (B) 5 (C) 6 (D) 7
- 2 One femto is equal to
(A) 10^{-9} (B) 10^{-18} (C) 10^{-6} (D) 10^{-15}
- 3 Resultant of two perpendicular vectors of equal magnitude A is
(A) A^2 (B) A (C) $\sqrt{2} A$ (D) 2A
- 4 If $\vec{A} = 2\hat{i} + 3\hat{j} - \hat{k}$ and $\vec{B} = 4\hat{i} + 6\hat{j} - 2\hat{k}$ the angle between them will be
(A) 0° (B) 45° (C) 60° (D) 90°
- 5 A bullet shot straight up, returns to its starting point in 10 sec, the initial speed was
(A) 10 m/sec (B) 49 m/sec (C) 24 m/sec (D) 98 m/sec
- 6 Horizontal range is equal to 4 times of its maximum height only if angle of projection is
(A) 90° (B) 45° (C) 60° (D) 30°
- 7 When two protons are brought closer together, then
(A) K.E increases (B) P.E decreases (C) P.E increases (D) P.E remains same
- 8 The time period of artificial satellite close to earth is given by
(A) $\frac{2\pi R}{V}$ (B) $2\pi RV$ (C) $\frac{2\pi V}{R}$ (D) $\frac{\pi R}{V}$
- 9 If a body of mass 10 kg is allowed to fall freely, its weight becomes
(A) 10 N (B) 0 N (C) 100 N (D) 9.8 N
- 10 A two (2) meter high tank is full of water. A hole appears at its middle. The speed of efflux will be
(A) 3.75 ms^{-1} (B) 5.11 ms^{-1} (C) 4.10 ms^{-1} (D) 4.42 ms^{-1}
- 11 The distance covered by a body in one complete vibration is 20 cm. What is the amplitude of the body
(A) 10 cm (B) 20 cm (C) 1 cm (D) 5 cm
- 12 If the speed of sound in air at given pressure is 'V' then doubling the pressure, the new speed becomes
(A) 2 V (B) V (C) 3 V (D) 4 V
- 13 A stretched string vibrates in n loops, its length in terms of wavelength is
(A) $\frac{n\lambda n}{2}$ (B) $(n+1)\frac{\lambda n}{2}$ (C) $(n + \frac{1}{2})\frac{\lambda n}{2}$ (D) $(n + \frac{1}{2})\lambda n$
- 14 Which of the following phenomenon cannot produce colours with white light?
(A) Diffraction (B) Interference (C) Polarization (D) Dispersion
- 15 An astronomical telescope has objective of focal length 100 cm and eyepiece of focal length 10 cm. Its magnifying power is
(A) 100 (B) 1000 (C) 10 (D) 1
- 16 Change in entropy of reversible process is
(A) Positive (B) Maximum (C) Negative (D) Zero
- 17 Isobaric process is one in which remains constant
(A) Volume (B) Pressure (C) Temperature (D) Energy

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

D
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16

i	Define the terms , precision and accuracy
ii	Write the dimensions of (a) Pressure (b) Density
iii	How many seconds are in one year ? Calculate
iv	Differentiate in physical and non-physical quantities with examples
v	At what point or points in its path does a projectile have its minimum speed , its maximum speed ?
vi	Define impulse and show how it is related to linear momentum ?
vii	Why ballistic missiles are not useful for long range ?
viii	State second law of motion in terms of momentum
ix	A thermos flask containing milk as a system is shaken. Does the temperature of milk rise ?
x	Specific heat of gas at constant pressure is greater than specific heat at constant volume. Why ?
xi	Why entropy is called time arrow ?
xii	Can we say that first law of thermodynamics is law of conservation of energy ? Explain

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

16

i	What changes take place in a vector when it is multiplied by “ - 2 ” ?
ii	How the direction of the vector product of two vectors can be determined ? Explain
iii	Can a vector have rectangular component greater than the vector's magnitude ? Explain
iv	Define escape velocity. Does the escape velocity of a body depend upon its mass ?
v	In which case more work is done ? When a 50 kg bag of books lifted through 50 cm ; or when 50 kg crate is pushed through 2 m across the floor with force of 50 N ?
vi	Differentiate between renewable and non-renewable energy sources with examples
vii	Why does the coasting rotating system slow down as water drops into the beaker ?
viii	Why does a diver change his body positions before and after diving into the pool ?
ix	Calculate rotational K.E of solid circular disc and hoop
x	Can visible light produce interference fringes ? Explain
xi	What is meant by optically active crystals ? Give at least two examples
xii	Find the grating element of the diffraction grating containing 2000 lines/cm

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

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i	Write down the properties of an ideal fluid
ii	Does frequency depend on amplitude of harmonic oscillator ? Explain briefly
iii	Can we realize an ideal simple pendulum ? Explain
iv	What will be the time period and frequency of a simple pendulum at the centre of earth ?
v	What is the effect of pressure and density on speed of sound ?
vi	Discuss briefly the phase changes when the transverse wave is reflected by a rarer and denser medium
vii	Is it possible for two identical waves travelling in the same direction along a string to give rise to a stationary wave ?
viii	Write down the importance of collimator in spectrometer
ix	One can buy a cheap microscope for use of children. The image seen in such a microscope have coloured edges. Why is this so ?

SECTION-II

Note: Attempt any Three questions from this section

8 x 3 = 24

Q.5 (A)	Define and formulate absolute gravitational potential energy	5
(B)	Find the angle between two vectors $\vec{A} = 5\hat{i} + \hat{j}$ and $\vec{B} = 2\hat{i} + 4\hat{j}$	3
Q.6 (A)	State and prove law of conservation of linear momentum	5
(B)	A body of moment of inertia $I = 0.80 \text{ kg m}^2$ about a fixed axis , rotates with a constant angular velocity of 100 rad s^{-1} . Calculate its angular momentum L and the torque to sustain this motion	3
Q.7 (A)	State and prove Bernoulli's equation for ideal fluid	5
(B)	A pipe has length 1 m. Determine the frequency of fundamental and first two harmonics (a) if pipe is open at both ends (b) if pipe is closed at one end . (Speed of sound in air = 340 ms^{-1})	3
Q.8 (A)	Why simple pendulum is called simple. Also , derive a relation for its time period	5
(B)	Sodium light ($\lambda = 589 \text{ nm}$) is incident normally on a grating having 3000 lines per centimeter. What is the highest order of the spectrum obtained with this grating ?	3
Q.9 (A)	What is Astronomical telescope ? Describe its construction and working. Also find its magnifying power	5
(B)	Calculate the entropy change when 1.0 kg ice at 0°C melts into water at 0°C . Latent heat of fusion of ice = $L_f = 3.36 \times 10^5 \text{ J kg}^{-1}$	3

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PHYSICS

GROUP : SECOND

OBJECTIVE

TIME: 20 MINUTES

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

DGR-92-22

- 1 Which pair of physical quantity has the same dimension
(A) Work and Power (B) Force and Torque (C) Momentum and Impulse (D) Torque and Power
- 2 The significant zero's in 0.04060 are
(A) 4 (B) 3 (C) 6 (D) 2
- 3 $\hat{i} \cdot (\hat{j} \times \hat{k}) + \hat{j} \cdot (\hat{k} \times \hat{i}) =$
(A) 1 (B) 2 (C) 0 (D) -1
- 4 If a force of 5 N is acting along x-axis, its component along x-axis is
(A) 5 N (B) 0 N (C) 3 N (D) 4 N
- 5 The angle of projection for which max. height is equal to the horizontal range is
(A) 45° (B) 67° (C) 76° (D) 56°
- 6 Rate of change of momentum of freely falling object is equal to
(A) K.E (B) Momentum (C) Acceleration (D) Weight
- 7 When two protons are brought closer their ?
(A) P.E increases (B) K.E increases (C) P.E Decreases (D) K.E Decreases
- 8 A body of mass 10 kg is falling freely, its weight appears
(A) 98 N (B) 0 N (C) 10 N (D) 9.8 N
- 9 Rotational K.E of disc is
(A) $\frac{1}{2} mv^2$ (B) $\frac{1}{4} IW^2$ (C) $\frac{1}{4} mv^2$ (D) $\frac{1}{8} mv^2$
- 10 Maximum drag force on a 1 kg falling sphere is
(A) 9.8 N (B) 1 N (C) 98 N (D) 4.9 N
- 11 The distance covered by a body in one complete vibration is 20cm. What is the amplitude of vibration ?
(A) 10 cm (B) 5 cm (C) 15 cm (D) 20 cm
- 12 The distance between 1st node and 4th anti node is
(A) $5 \lambda/4$ (B) $3 \lambda/4$ (C) $3 \lambda/2$ (D) $7 \lambda/4$
- 13 Which quantity changes due to interference of sound waves of same frequency ?
(A) Time period (B) Wave length (C) Amplitude (D) Frequency
- 14 In Michelson Interferometer, to shift bright to dark fringe, the mirror should be displaced by
(A) $\lambda/4$ (B) $\lambda/2$ (C) $\lambda/3$ (D) λ
- 15 Light emitted from LED has wavelength
(A) 1.3 μm (B) 1.2 μm (C) 1.4 μm (D) 1.5 μm
- 16 For isothermal process
(A) $\Delta U = 0$ (B) $Q = W$ (C) $PV = \text{constant}$ (D) All of these
- 17 For diatomic gas $C_v = 5/2 R$ then C_p will be
(A) $3/2 R$ (B) $2/7 R$ (C) $7/2 R$ (D) $9/2 R$

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

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- i Why do we find it useful to have two units for the amount of a substance, the kilogram and the mole?
- ii The period of a simple pendulum is measured by a stop watch. What type of errors are possible in the time period?
- iii How can the uncertainty be calculated in timing experiments?
- iv Calculate how many seconds are there in one year?
- v Differentiate between variable velocity and instantaneous velocity
- vi A 1500 kg car has its velocity reduced from 20 ms^{-1} to 15 ms^{-1} . How large was the average retarding force?
- vii Explain the circumstances in which velocity \vec{v} and acceleration \vec{a} of a car are
(a) antiparallel (b) perpendicular to each other
- viii Motion with constant velocity is a special case of motion with constant acceleration. Is this statement true? Discuss
- ix Prove that absolute temperature of an ideal gas is directly proportional to average translational kinetic energy of gas molecules
- x Give at least two examples of an adiabatic process
- xi Why does the pressure of a gas in a car tyre increase when it is driven through some distance?
- xii Is it possible to convert internal energy into mechanical energy? Explain with an example

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

16

- i Write the rules to find direction θ of the resultant in different quadrants
- ii If one of the rectangular components of a vector is not zero, can its magnitude be zero? Explain
- iii If all the components of the vectors \vec{A}_1 and \vec{A}_2 were reversed. How would this alter $\vec{A}_1 \times \vec{A}_2$
- iv A disc without slipping rolls down a hill of height 10 m. If the disc starts from rest at the top of the hill. What is its speed at the bottom?
- v Why microwaves are preferred in communication satellites?
- vi An object has 1 J of potential energy. What does it mean? Explain
- vii What is orbital velocity? Explain how it is related to orbital radius?
- viii A force F acts through a distance L . The force is then increased to $3F$, and then acts through a further distance $2L$. Draw the work diagram to scale
- ix When a rocket re-enters the atmosphere, its nose cone becomes very hot. Where does this energy come from?
- x Why Polaroid sunglasses are better than ordinary sunglasses?
- xi In Young's slits experiment, one of the slits is covered with blue filter and other with a red filter. What would be the pattern of light intensity on the screen?
- xii Define fringe spacing and write its formula

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

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- i Define the term viscosity. Give its units
- ii Show that for horizontal mass spring system, elastic potential energy is given by $P.E = \frac{1}{2} kx^2$, where x is displacement
- iii Describe some common phenomena in which resonance plays an important role
- iv Given $x = 0.5 \sin \frac{\pi}{8} t$, Find the amplitude and frequency of the mass performing simple harmonic motion
- v As a result of distant explosion, an observer senses a ground tremor and then hears the explosion. Explain the time difference.
- vi What features do longitudinal waves have common with transverse waves?
- vii What are the conditions on the path difference for constructive and destructive interference of two waves?
- viii What is the refractive index of the medium in which speed of light is $2.75 \times 10^8 \text{ m/s}$?
- ix Explain the difference between angular magnification and resolving power of an optical instrument

SECTION-II

Note: Attempt any Three questions from this section

8 x 3 = 24

- Q.5 (A) Define work and give its SI unit. How does it change with angle θ between force and displacement. Discuss work done by variable force 5
- (B) Find the angle between the two vectors $\vec{A} = 5\hat{i} + \hat{j}$ and $\vec{B} = 2\hat{i} + 4\hat{j}$ 3
- Q.6 (A) What procedure you suggest to produce artificial gravity. Derive a relation for the frequency of space station to produce artificial gravity. 5
- (B) A proton moving with speed of $1.0 \times 10^7 \text{ m/s}$ passes through a 0.020 cm thick sheet of paper and emerges with a speed of $2.0 \times 10^6 \text{ m/s}$. Assuming uniform deceleration, find retardation and time taken to pass through the paper. 3
- Q.7 (A) State and explain Bernoulli's Equation 5
- (B) The wavelength of the signals from a radio transmitter is 1500 m and the frequency is 200 KHz. What is the wavelength for a transmitter operating at 1000 KHz and with what speed the radio waves travel? 3
- Q.8 (A) Prove that total energy remains conserved in mass spring system, Oscillating with SHM. 5
- (B) In a double slit experiment the second order maximum occur at $\theta = 0.25^\circ$. The wavelength is 650 nm. Determine the slit separation 3
- Q.9 (A) Define molar specific heat of a gas at constant pressure (C_p) and at constant volume (C_v). Also prove that $C_p - C_v = R$ 5
- (B) A glass light pipe in air will totally internally reflect a light ray if its angle of incidence is at least 39° . What is the minimum angle for total internal reflection if pipe is in water {Refractive index of water 1.33} 3