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SECTION "A"

MULTIPLE CHOICE QUESTION

Q1. Choose the correct answer for each from the given options.

1. If a man goes above the earth's surface to a distance equal to thrice the earth's radius, the value of acceleration due to gravity at that point becomes.
   * 1/3 g * ¼ g * 1/9 g * 1/16 g
2. The Y-component of vector |A| = 15 units when it forms an angle of 50^0 with positive x-axis is:
   * 11.5 units * -11.5 units * 9.6 units * -9.6 units
3. Laplace formula is derived for:
   * adiabatic change * isothermal change * isobaric change * isochoric change
4. A car weighing 3000 N moving with a uniform velocity of 14 m/s. its acceleration after 2 sec will be:
   * zero * $14ms^{-1}$ * $7\ ms^{-1}$ * $9.8\ ms^{-1}$
5. Torque is defined as the rate of change of:
   * Angular momentum *Angular velocity
   * Angular acceleration * Linear momentum
6. The dimension of "G" is:
   * $ML^{-2}T^{-3}$ * $M^{-1}L^{-2}T^{-3}$ * $M^{-1}L^{-3}T^{-2}$ * $M^{-1}L^{-2}T^{-2}$
7. If $\hat{i}$, $\hat{j}$ and $\hat{k}$ are unit vector then $\hat{k}.(\hat{i} \times \hat{j})$ is equal to:
   * zero * one * $\hat{j}$ *$\hat{k}$
8. An angle subtended at center of a circle by an arc whose length is equal to the radians is:
   * 37.3^0 *47.3^0 * 57.3^0 * 67.3^0
9. Power is equal to:
   * $\vec{F} \times \frac{\vec{d}}{t}$ * $\vec{F} . \frac{\vec{d}}{t}$ * $\vec{F} \times \frac{\vec{v}}{t}$ * $\vec{F} . \frac{\vec{v}}{t}$
10. How much distance cover by a 20Kg ball in one second, starting from rest fall freely?
    * 19.6 m * 9.8 m * 4.0 m * 4.9 m
11. Monochromatic yellow light is unable show:
    * dispersion * reflection * refraction * interference
12. An object is thrown at an angle 25^0 to obtain range 500 m, the same range will be obtain at
    * 55^0 * 65^0 * 45^0 * 35^0
13. Two convex lenses of Focal length 8 cm each are place in contact, the focal length of the combination will be:
    * 4 cm * 16 cm * 8cm * 25 cm
14. When the velocity of object is halved and the mass is doubled then its kinetic energy will be:
    * Half * Double * One third * Remain same
15. This defect can be easily corrected by reducing aperture of the lens:
    * chromatic aberration * Hyperopia * spherical aberration * astigmatism
16. $\sin\theta = \theta$ if θ is specifically less than:
    * 1 radian * 15^0 * 5^0 * 10^0
17. The S.I unit of Intensity of Sound is:
    * $Watt/m^2$ * Diopter * Decibel * Weber

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SECTION "B"

SHORT-ANSWER QUESTIONS

Attempt any ten questions from this section. All question Carries equal marks.

i. State and prove Law of Conservation of Linear momentum. Also draw relevant diagram.

ii. Two vectors A and B are such that |A| = 4, |B| = 6 and A.B = 8, find
a) The angle between A and B **b)** The length| A – B |

iii. At what distance from the Center of earth does the value of acceleration due to gravity becomes 50% of its value on the Earth's surface.

iv. Derive the following expression for a projectile: **(i)** Maximum Height **(ii)** total time of flight

v. What are the defects in lenses? How can they be removed.?

vi. A 40 gram bullet is fired into a 10 kg block that is suspended by a long cord so that it can swing as a pendulum. The block is so displaced that its center of gravity rises by 10 cm. what is the speed of bullet.?

vii. Define a conservation field. Show that gravitational field is conservative field.

viii. 400 fringes appear to pass a reference point when the moveable mirror of Michelson's Interferometer is moved by 0.088 mm. what is the wavelength of light?

ix. A simple pendulum completes 4 vibrations in 8 sec on the surface of earth. Find the time period on the surface of the moon where the acceleration due to gravity is one-sixth that of earth.

x. A boy throws a ball upward from the top of a tower with a speed of 12m/s. one the way down, it just misses the thrower and falls to the ground 50m below. How long the ball does remains in air.

xi. Tarzan swing on a vine of length 5 m in a vertical circle under the influence of gravity. When the vine makes an angle of 30^0 with the vertical, tarzan has a speed of 4m/s. find:
a) Centripetal acceleration b) His tangential acceleration

xii. A converging lens of 4 diopter is placed in contact with a diverging lens of -2 diopter. Find the power and the focal length of combination.

xiii. A source of Sound having a frequency of 100 Hz moving away from the stationary observer with a speed of 1/10th that of sound. What is the apparent frequency of sound heard by observer.

xiv. Show that the following formulae are dimensionally correct: **i)** $T = 2\pi\sqrt{\frac{m}{k}}$ **ii)** $V = \sqrt{\frac{T}{\mu}}$

SECTION "C"

DETAILED-ANSWER QUESTIONS

Attempt any two questions from this section. All question Carries equal marks.

3(a) Define elastic and inelastic collision. Two non-rotating sphere of masses m_1 and m_2 initially moving with the velocities U_1 and U_2 respectively in one dimension, collide elastically. Derive the expression for their final velocity V_1 and V_2.

(b) Define standing waves? Discuss the vibrations in a stretched strings when it vibrates **(i)** one loop **(ii)** two loop **(iii)** three loops. Also derive the formula for the frequency of nth loops.

4(a) Describe Young's Double slit experiment, using this arrangement; obtain the expression for the position of bright fringes. Also calculate the fringe spacing.

(b) Deduce the expression for the variation of acceleration due to gravity **i)** with altitude **ii)** with depth

5(a) Two forces F_1 and F_2 in xy-plane are acting at a point and making an angle θ_1 and θ_2 with +ve x-axis respectively. How can these vectors be added by rectangular component method? Derive the relevant formula and generalize the result for "n" vectors.

(b) Describe the Construction and working of a compound microscope. With the help of a ray diagram. Derive the relevant formula for its magnification