

Physics

PR – XI (A-I-BP1) (26)

- ۱۔ ہر سوال کے سامنے چار دائرے دیئے گئے ہیں۔ صرف صحیح جواب والا دائرہ بھر دیں۔
۲۔ دائروں کو شیڈ (بھرنے) کے لیے نیلے یا کالے رنگ کا پین استعمال کریں۔
۳۔ جواب میں ایک سے زائد دائرے بھرنے سے جواب غلط تصور ہوگا۔

Time: 20 Min

SECTION-A

Marks: 18

- 1) If the angular speed of rotation is doubled, keeping all other factors constant, the centripetal force F acting on the body becomes:
☐ $2F$ ☒ $4F$ ☐ $F/2$ ☐ $F/4$
- 2) The ratio of the cross sectional area of two pipes A and B is 2:3. For steady incompressible flow, the ratio of fluid velocities ($V_A:V_B$) in the pipes will be:
☐ 2:3 ☐ 4:9 ☒ 3:2 ☐ 4:9
- 3) The kinetic energy of a body in simple harmonic motion is maximum when its:
☐ Potential energy is maximum
☒ Potential energy is zero ☐ Total energy is zero
☐ Displacement is maximum
- 4) Two consecutive crests in a series of transverse waves are 10cm apart. If the frequency of waves is 50Hz, its speed will be:
☐ 3 m/s ☒ 5 m/s ☐ 6 m/s ☐ 10 m/s
- 5) When blue light in Young double slit experiment is replaced by red light, the spacing between two consecutive bright fringes.
☒ Increases ☐ Decreases
☐ Remains constant ☐ Reduces to half
- 6) A measure of the disorder of a system is called:
☐ Internal energy ☐ Specific heat
☒ Entropy ☐ Heat
- 7) In one dimensional elastic collision, if a body of mass m_1 moving with velocity V collides with a body of mass m_2 ($m_2 \gg m_1$) at rest, the velocity of m_2 after collision is approximately:
☒ V ☐ $2V$ ☐ 0 ☐ $V/2$
- 8) A body is displaced by a force F covering a distance d along the

horizontal axis, the magnitude of the work done by the gravitational force is:

- ☐ Fd ☐ $-Fd$ ☐ $0.5 Fd$ ☒ Zero

9) Two bodies A and B do the same amount of work in times 3s and 6s respectively. The power of B is:

- ☐ Double that of A ☒ Half that of A
☐ Same as that of A ☐ Four times that of A

10) The escape velocity is V for a body of mass m on earth's surface. The escape velocity for a body of mass $2m$ will be:

- ☒ V ☐ $2V$ ☐ $V/4$ ☐ $V/2$

11) The centripetal acceleration in orbiting satellite is caused by:

- ☒ Gravitational force ☐ Normal force
☐ Frictional force ☐ Tension force

12) The net torque required to produce angular acceleration of 2 rad s^{-2} in a body of moment of inertia 6 kg m^2 is:

- ☐ 3 Nm ☐ 6 Nm ☐ 8 Nm ☒ 12 Nm

13) The result of $2.231 + 15.6$ to the correct number of significant figures in the given is:

- ☐ 17.831 ☒ 17.83 ☐ 17.8 ☐ 18

14) Two forces of magnitudes 6N and 10N act at a point. Which of the given cannot be the magnitude of their resultant force?

- ☒ 16 N ☐ 3 N ☐ 4 N ☐ 6 N

15) If a vector A is directed perpendicular to another vector B , their scalar product will be:

- ☐ AB ☐ $-AB$ ☐ $AB/2$ ☒ Zero

16) The example of cross product among the given is:

- ☒ Torque ☐ Work ☐ Power ☐ Kinetic energy

17) The slope of a displacement-time graph represents:

- ☐ Displacement ☒ Velocity
☐ Acceleration ☐ Speed

18) The acceleration of a projectile at the highest point of its trajectory is:

- ☐ Less than 9.8 m/s^2 ☒ Equal to 9.8 m/s^2
☐ Greater than 9.8 m/s^2 ☐ Zero

Physics

Note: Time allowed for Section-B and Section-C is 2 Hours and 40 minutes.

SECTION-B

Q2: Answer any TEN parts. Each part carries FOUR marks.

1. Distinguish between systematic errors and random errors associated with measurements in physics by giving one example of each.
2. Show that the famous Einstein's equation $E=mc^2$ is correct, using dimensional analysis.
3. State the first condition of equilibrium with an example. Express it mathematically. What types of equilibrium is guaranteed by this condition?
4. Can the scalar products of two non-zero vectors A and B be zero? Provide a simple proof and give an example.
5. Prove that the total work done in a gravitational field along a closed path is zero.
6. Define work. Write its general mathematical formula. state the conditions in which work done by a force is:
(a) Positive (b) Negative
7. State Bernoulli equation for the flow of an ideal fluid. Also explain the working of filter pump based on this equation.
8. The radius of water pipe decreases from 0.2m to 0.1m. if the velocity of water in the wider portion of the pipe is 3ms^{-1} , calculate the velocity in the narrower portion of the pipe.
9. Define the following terms in the context of wave motion:
(a) Wave speed (b) Time period of wave
(c) Wavelength of wave (d) Amplitude of wave
10. Briefly explain the effect of the following on the speed of sound in air:
(a) Increase in air pressure (b) Increase in air temperature
11. Define Doppler effect and derive the mathematical expression for the apparent frequency of sound when a sounding source moves toward a stationary listener.
12. Write four necessary conditions to observe the interference of light waves.
13. An optical grating has 4000 lines per cm. the second order bright

image is observed at an angle of 24° . Determine the wavelength of the incident light.

SECTION-C

Note: Attempt any THREE questions. All questions carry equal marks.

- Q3 (a) What is meant by the term collision in Physics? Distinguish between Elastic and inelastic collision by giving an example of each type.
(b) Two bodies of masses 3 kg and 6 kg are moving in opposite directions with velocities 4 ms^{-1} and 1 ms^{-1} respectively. They collide and stick together, moving as a single system. Calculate their final common velocity.
- Q4 (a) Define orbital velocity. Derive mathematical relationship between orbital velocity (V) of artificial satellite and radius (r) of its circular orbit.
(b) The tip of a fan blade rotates at 60 rev/min. If its distance from the axis of rotation is 0.5m, calculate its linear speed.
- Q5 (a) Prove mathematically that the motion of a mass (m) attached with elastic spring of spring's constant (k) is simple harmonic motion.
(b) Define the given terms of oscillatory motion.
(i) Time period (ii) Frequency (iii) Amplitude (iv) Angular frequency
- Q6 (a) State first law of thermodynamics. Write the mathematical expression for law of thermodynamics. Explain it with an example.
(b) Differentiate between reversible and irreversible processes by giving two examples of each type.