



PHYSICS

MHT - CET - Physics

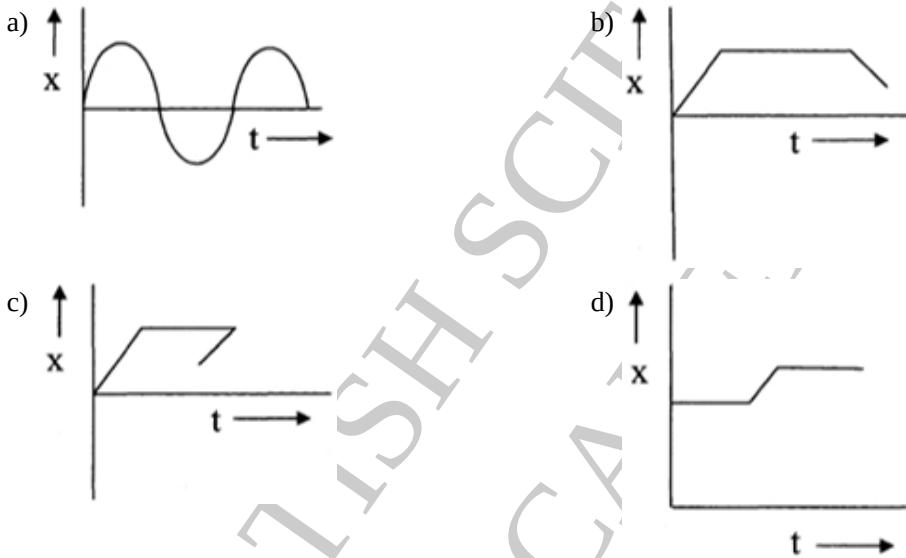
Time Allowed: 1 hour

Maximum Marks: 50

1. The diameter of a flywheel is 1.2 m and it makes 900 revolutions per minute. Calculate the acceleration at a point on its rim [1]

- a) $270 \pi^2 \text{ m/s}^2$
- b) $360 \pi^2 \text{ m/s}^2$
- c) $540 \pi^2 \text{ m/s}^2$
- d) 540 m/s^2

2. Which of the following position-time graph does NOT exist in nature? [1]



3. A ball of mass 250 g moving with 20 m/s strikes a vertical wall and rebounds along the same line with a velocity of 15 m/s. If the time of contact is 0.1 s, the force exerted by the wall on the ball is [1]

- a) -87.5 N
- b) -12.5 N
- c) 87.5 N
- d) 12.5 N

4. A man weighing 60 kg is in a lift moving down with an acceleration of 1.8 ms^{-2} . The force exerted by the floor on him is [1]

- a) 480 N
- b) Zero
- c) 696 N
- d) 588 N

5. If the density of the earth is tripled keeping its radius constant, then acceleration due to gravity will be ($g = 9.8 \text{ m/s}^2$) [1]

- a) 4.9 m/s^2
- b) 2.45 m/s^2
- c) 9.8 m/s^2
- d) 29.4 m/s^2

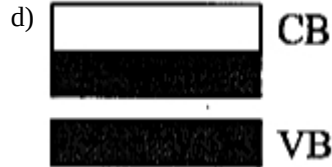
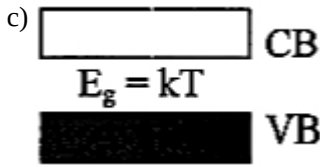
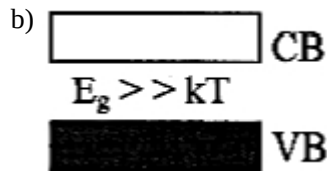
6. The value of gravitational acceleration at a height equal to radius of earth, is [1]

- a) 75% of value at earth's surface
b) 25% of value at earth's surface
c) 50% of value at earth's surface
d) same as value at earth's surface
7. Select the WRONG statement. [1]
- i. Boyle's law states that at constant temperature, the volume of given mass of gas is inversely proportional to its pressure.
ii. Charles' law states that at constant pressure, volume of a given mass of gas is directly proportional to its absolute temperature.
iii. The value of R is same for all gases.
iv. Boyle's law states that at constant temperature, the volume of a gas is directly proportional to its pressure.
- a) Option (i)
b) Option (iv)
c) Option (iii)
d) Option (ii)
8. Expansion during heating [1]
- a) decreases weight.
b) decreases density.
c) increases weight.
d) decreases density and weight.
9. Two aeroplanes A and B, each moving with a speed of 720 km/hour, are moving directly away from each other. [1]
Aeroplane A emits a whistle of frequency 1080 Hz. The apparent frequency heard by a person in plane B will be (velocity of sound in air = 340 m/s)
- a) 300 Hz
b) 260 Hz
c) 200 Hz
d) 280 Hz
10. Which of the following is the example of transverse wave? [1]
- a) Sound waves
b) Compressional waves in a spring
c) Vibration of string
d) Pulse wave
11. Light appears to travel in straight lines since [1]
- a) its velocity is very large.
b) its wavelength is very small.
c) it is not absorbed by the atmosphere.
d) it is reflected by the atmosphere.
12. If two plane mirrors are parallel to each other, the object lying between them will have (n) number of images [1]
given by
- a) $n = 1$
b) $n = 0$
c) $n = 3$
d) $n = \infty$
13. Three point charges of $+2q$, $+2q$ and $-4q$ are placed at the corners A, B and C of an equilateral triangle ABC of [1]
side 'x'. The magnitude of the electric dipole moment of this system is
- a) $3\sqrt{2} qx$
b) $2qx$
c) $2\sqrt{3} qx$
d) $3qx$
14. Two positive point charges are 3 m apart and their combined charge is $20 \mu C$. If the force between them is 0.075 [1]
N, then the charges are
- a) $12 \mu C$, $8 \mu C$
b) $15 \mu C$, $5 \mu C$

c) $10 \mu\text{C}$, $10 \mu\text{C}$

d) $14 \mu\text{C}$, $6 \mu\text{C}$

15. Which one of the energy band diagrams shown in the figure corresponds to that of semiconductor? [1]



16. A particle with charge Q coulomb, tied at the end of an inextensible string of length R metre, revolves in a vertical plane. At the centre of the circular trajectory, there is a fixed charge of magnitude Q coulomb. The mass of the moving charge M is such that $Mg = \frac{Q^2}{4\pi\epsilon_0 R^2}$. If at the highest position of the particle, the tension of the string just vanishes, the horizontal velocity at the lowest point has to be [1]

a) $\sqrt{5gR}$

b) $2\sqrt{gR}$

c) 0

d) $\sqrt{2gR}$

17. A wheel is 0.25 m in radius. When it makes 15 revolutions per minute, its linear speed at a point on circumference is [1]

a) $\frac{\pi}{2}$ m/s

b) π m/s

c) $\frac{\pi}{8}$ m/s

d) $\frac{\pi}{4}$ m/s

18. Two solid cylinders P and Q of same mass and same radius start rolling down a fixed inclined plane from the same height at the same time. Cylinder P has most of the mass concentrated near its surface, while Q has most of its mass concentrated near the axis. Which statement (s) is/(are) correct? [1]

a. Both cylinders P and Q reach the ground at the same time.

b. Cylinder P has larger linear acceleration than cylinder Q.

c. Both cylinders P and Q reach the ground with same translational kinetic energy.

d. Cylinder Q reaches the ground with larger angular speed.

a) Option (c)

b) Option (d)

c) Option (a)

d) Option (b)

19. The angle of banking of the road does not depend upon [1]

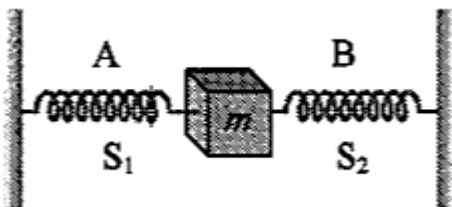
a) radius of curvature of the road.

b) speed of the vehicle.

c) mass of the vehicle.

d) acceleration due to gravity.

20. In the figure, S_1 and S_2 are identical springs. The oscillation frequency of the mass m is f . If one spring is removed, the frequency will become [1]



29. A jar has a mixture of hydrogen and oxygen gas in the ratio of 1 : 5. The ratio of mean kinetic energies of hydrogen and oxygen molecules is [1]
- a) 1 : 4
b) 1 : 1
c) 1 : 16
d) 1 : 5
30. Two thermometers A and B are exposed in sunlight. The valve of A is painted black but B is not painted. The correct statement regarding this case is [1]
- A. Temperature of A will rise faster than B but the final temperature will be the same in both.
B. Both A and B show equal rise in beginning.
C. Temperature of A will remain more than B.
D. Temperature of B will rise faster.
- a) Option (D)
b) Option (C)
c) Option (B)
d) Option (A)
31. An electric dipole has the magnitude of charge q and dipole moment p. It is placed in a uniform electric field. If its dipole moment is along the direction of the field then the force on it and its potential energy are respectively [1]
- a) qE and maximum.
b) zero and minimum.
c) qE and minimum.
d) $2qE$ and minimum.
32. Two concentric spherical conducting shells of radii R and 2R carry charges Q and 2Q respectively. When both the shells are connected by a conducting wire, the change in potentials on the outer shell is $\left(k = \frac{1}{4\pi\epsilon_0}\right)$ [1]
- a) zero
b) $\frac{2kQ}{R}$
c) $\frac{3kQ}{R}$
d) $\frac{kQ}{R}$
33. Small drops of the same size are charged to V volt each. If n drops coalesce to form a single large drop, its potential will be [1]
- a) $\frac{V}{n}$
b) Vn
c) $Vn^{\frac{2}{3}}$
d) $Vn^{\frac{1}{3}}$
34. Two identical light sources s_1 and s_2 emit light of same wavelength λ . These light rays will exhibit interference if their [1]
- a) phase differences remain constant.
b) light intensities change randomly.
c) phases are distributed randomly.
d) light intensities remain constant.
35. A ray of light strikes a glass slab of thickness t. It emerges on the opposite face, parallel to the incident ray but laterally displaced. The lateral displacement, Δx is [1]
- a) $\Delta x = \frac{t \sin i}{\cos r}$
b) $\Delta x = \frac{t \sin(i-r)}{\cos r}$
c) $\Delta x = 0$
d) $\Delta x = t \sin(i - r) \cos r$
36. Unpolarised light consists of electric field vectors in _____. [1]
- a) perpendicular to plane of paper
b) plane of paper
c) all possible planes
d) any one plane
37. A uniform wire of 16Ω is made into the form of a square. Two opposite corners of the square are connected by [1]

- a) amplified
c) rectified
- b) alternating
d) pulsating D.C. voltage
45. Photons are not deflected in electric and magnetic field as they are [1]
a) electrically neutral
b) negatively charged
c) positively charged
d) affected by gravitational field
46. If by successive disintegration of ${}_{92}\text{U}^{238}$, the final product obtained is ${}_{82}\text{Pb}^{206}$, then how many number of α and β particles are emitted? [1]
a) 12 and 6
b) 6 and 8
c) 8 and 12
d) 8 and 6
47. Which pair is isotonic? [1]
a) ${}_{6}\text{C}^{14}, {}_{7}\text{N}^{14}$
b) ${}_{7}\text{N}^{13}, {}_{6}\text{C}^{12}$
c) ${}_{6}\text{C}^{14}, {}_{6}\text{C}^{12}$
d) ${}_{7}\text{N}^{13}, {}_{7}\text{N}^{14}$
48. The radius of hydrogen atom, in its ground state, is of the order of [1]
a) 10^{-8} cm
b) 10^{-5} cm
c) 10^{-4} cm
d) 10^{-6} cm
49. The current gain of a transistor in common-emitter configuration is 80. If the emitter current be 8.1 mA, then what is the collector current? [1]
a) 8.1 mA
b) 1.0 mA
c) 8.0 mA
d) 0.1 mA
50. A reversible engine absorbs 746 J heat energy from source and rejects 546 J to sink. If the temperature-difference between source and sink is 100 K, then the efficiency of engine will be approximately [1]
a) 40%
b) 36%
c) 27%
d) 52%