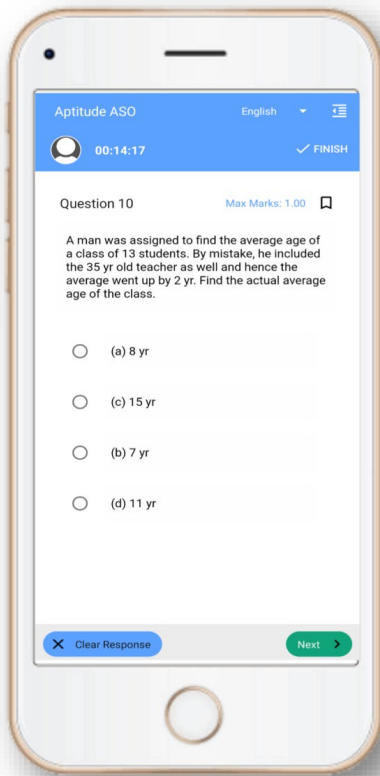


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## B - SECTION - III

## SCIENCE (PCM)

## PHYSICS

41. A projectile is fired from the ground level with a speed of 18 m/s at an angle of  $60^\circ$  with the horizontal. After 1 second, a second projectile is fired from the same place with a speed of 10 m/s at an angle  $45^\circ$  with the horizontal. When both the projectiles are in flight, the relative acceleration of the second projectile with respect to the first is :

- (A) 16 m/s<sup>2</sup>  
 (B) 5.6 m/s<sup>2</sup>  
 (C) -5.6 m/s<sup>2</sup>  
 (D) zero

42. The torque about the point O(3, -1) of a force  $\vec{F}$  (2, 4) N on a plane X-Y passing through the point A(5, 2) is :

(the co-ordinates of the point O and A are in meter)

- (A)  $2 \hat{k}$  N.m  
 (B)  $-2 \hat{k}$  N.m  
 (C)  $14 \hat{k}$  N.m  
 (D)  $-14 \hat{k}$  N.m

43. A planet is at distance 'a' from the sun and its time period of revolution is T yrs.

The planet suddenly comes to distance  $\frac{a}{2}$  closer to the sun. The new time period of revolution is :

- (A)  $\frac{T}{2}$  yrs  
 (B)  $\frac{T}{2\sqrt{2}}$  yrs  
 (C)  $\sqrt{2} T$  yrs  
 (D)  $2\sqrt{2} T$  yrs

44. A transverse wave of frequency 16 Hz travels along a straight string. Two points 4 m apart along the string have a phase difference of  $120^\circ$ . The wavelength of the travelling wave is :

- (A) 4 m  
 (B)  $\frac{8}{3}$  m  
 (C) 64 m  
 (D) 12 m

45. The focal length of a convex lens is 20 cm. The minimum distance between an object and its real image formed by the lens is :

- (A) 40 cm  
 (B) 80 cm  
 (C) 60 cm  
 (D) 20 cm



46. A bat at rest sends out ultrasonic sound waves at 34 kHz and receives them returned from the object. If the bat is moving away from the object at 5 m/s and the velocity of sound is 335 m/s, what is the apparent frequency heard by the bat ?
- (A) 33 kHz  
(B) 60 kHz  
(C) 32 kHz  
(D) 75 kHz
47. The length of a wire of uniform cross-section changes from  $L_1$  to  $L_2$  when the tensile force on it changes from  $T_1$  to  $T_2$ . The relaxed length of the wire is :
- (A)  $\frac{1}{2} (L_1 + L_2)$   
(B)  $\frac{L_1 T_2 + L_2 T_1}{T_1 + T_2}$   
(C)  $\frac{L_1 T_2 + L_2 T_1}{\sqrt{T_1 T_2}}$   
(D)  $\frac{T_1 L_2 - T_2 L_1}{T_1 - T_2}$
48. The capacitance of a spherical liquid drop is  $2 \mu\text{F}$ . One thousand such identical drops coalesce to form a large single spherical drop. The capacitance of the large drop is :
- (A)  $2000 \mu\text{F}$   
(B)  $500 \mu\text{F}$   
(C)  $20 \mu\text{F}$   
(D)  $2 \mu\text{F}$
49. An air bubble of radius ' $r$ ' doubles its radius as it rises from a depth ' $h$ ' to the surface of the lake at a constant temperature. If the atmospheric pressure is equal to 10 m height of the water column, neglecting surface tension the value of ' $h$ ' is :
- (A) 90 m  
(B) 70 m  
(C) 60 m  
(D) None of these

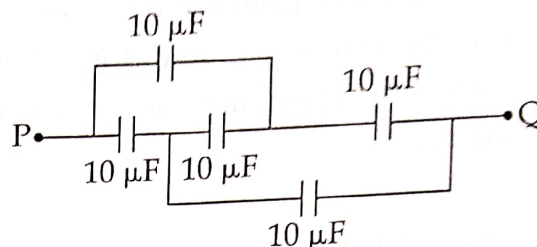
50. A concave mirror of focal length 10 cm and a convex mirror of focal length 15 cm are placed facing each other 40 cm apart. A point object is placed between the mirrors on their common axis at a distance of 15 cm from the concave mirror. Find the position of the image produced by the successive reflections, first at the concave mirror and then at the convex mirror.

- (A) 6 cm behind the convex mirror  
 (B) 4.28 cm behind the convex mirror  
 (C) 6 cm in front of the convex mirror  
 (D) 4.28 cm in front of the convex mirror

51. One mole of an ideal monatomic gas requires 210 J heat to raise its temperature by 10 K when heated at constant pressure. If the same gas is heated at constant volume to raise the temperature by the same amount, the heat required is :

- (A) 108.7 J  
 (B) 115.3 J  
 (C) 129 J  
 (D) 126 J

52. The equivalent capacitance between the points P and Q in the circuit given below is :



- (A) 40  $\mu\text{F}$   
 (B) zero  
 (C) 0.1  $\mu\text{F}$   
 (D) 10  $\mu\text{F}$

53. In an astronomical telescope, the power of the objective is 0.5 D and that of the eye piece is 20 D. The magnifying power of the telescope is :

- (A) 10  
 (B) 100  
 (C) 35  
 (D) 40

54. A geostationary satellite revolves around the earth :

- (A) in an orbit whose plane passes through the north pole and the south pole of the earth.  
 (B) twice in 24 hours.  
 (C) at an altitude of about 200 km above the surface of the earth.  
 (D) in an orbit whose plane passes through the equator of the earth.

55. A body is dropped from rest, while at the same instant a second body is thrown downwards with an initial velocity of 1 m/s. When will the distance between them be 18 m ?
- (A) 3 s  
(B) 1.8 s  
(C) 18 s  
(D) 12 s
56. The maximum current  $I$  which can pass through a fuse wire of circular cross-section without melting it varies with its radius ' $r$ ' as :
- (A)  $I \propto r$   
(B)  $I \propto r^{3/2}$   
(C)  $I \propto r^2$   
(D)  $I \propto \frac{1}{r^2}$
57. An ideal transformer is used on 220 V line to deliver 2 A at 110 V. The current through the primary is :
- (A) 10 A  
(B) 5 A  
(C) 1 A  
(D) 0.1 A
58. In a given electrical circuit, a  $10 \Omega$  resistor is parallel to a  $5 \Omega$  resistor. The ratio of the heat produced in the first resistor to that in the second resistor is :
- (A) 1 : 2  
(B) 2 : 1  
(C) 1 : 4  
(D) 4 : 1
59. In a series LCR circuit, the voltage across each resistor, inductor and capacitor is 10 volt. If the resistance is short circuited, the current in the circuit becomes :
- (A) Zero  
(B) Very large  
(C) 10 A  
(D) 5 A
60. Which of the following is a unit of self inductance ?
- (A) weber per ampere  
(B) volt second per ampere  
(C) joule per ampere  
(D) ohm second