

7. What is the work done in a given cyclic process given in the figure?

- A. $3 P_0 V_0$
B. $10 P_0 V_0$
C. $6 P_0 V_0$
D. $5 P_0 V_0$



8. A magnetic field of 20 T is directed perpendicular to the face of a coil of area 0.4 m^2 . What is the magnetic flux in this coil?

- A. Zero
B. 8 Wb
C. 4 Wb
D. 50 Wb

9. Which of the following systems can absorb some amount of heat without any change in its temperature?

- A. Ice at -10°C
B. Water at 10°C
C. Water at 0°C
D. Ice at 0°C

10. The heat capacity of object B is twice that of object A. Initially A is at 300K and B is at 400K. They are placed in thermal contact and the combination is isolated. The final temperature of both objects is

- A. 380K
B. 300K
C. 400K
D. 450K

11. Which type of elasticity (modulus) can be applicable for both liquid and solid materials?

- A. Young's modulus
B. Shear modulus
C. Bulk modulus
D. All

12. Which of the following could be relationship between the acceleration a and the displacement x of a particle involve simple harmonic motion.

- A. $a = 6x$
B. $a = -6x$
C. $a = 6x^2$
D. $a = -6x^2$

13. Three blocks of equal volume are completely submerged into water. The blocks are made of different materials: aluminium, iron and lead. Which of the following is the correct statement about the buoyant force on each block? ($\rho_{\text{aluminium}} = 2700 \text{ kg/m}^3$, $\rho_{\text{iron}} = 7800 \text{ kg/m}^3$, $\rho_{\text{lead}} = 11300 \text{ kg/m}^3$)

- A. $F_{\text{aluminium}} > F_{\text{iron}} > F_{\text{lead}}$
B. $F_{\text{aluminium}} < F_{\text{iron}} < F_{\text{lead}}$
C. $F_{\text{aluminium}} = F_{\text{iron}} = F_{\text{lead}}$
D. $F_{\text{aluminium}} = F_{\text{iron}} = F_{\text{lead}}$

14. If the ice point and the steam point temperatures on unknown scale X are 40°X and 160°X respectively, then what is the reading in degree X for a temperature of 50°C ?

- A. 100
B. 80
C. 140
D. 120

15. The magnetic field B on a vertical surface is in to the page. A positive charge q moves in a circular path as shown. Using right hand rule what is the direction of the magnetic force on the charge when it is at point A?

- A. downward
B. upward
C. to the right
D. to the left



16. A permanent magnet is dropped, south pole-down, through a conducting loop as shown in the figure. As the magnet falls toward the coil perpendicular to the area, what is the direction of the induced current before the magnet enters the loop?

- A. Upward
B. Clockwise
C. anticlockwise
D. Downward



17. What will happen to the frequency of a pendulum if we change the rope of a pendulum with another which is four times with the initial length?

- A. halved
B. doubled
C. decreased by one fourth
D. increased four times

18. How much work is done on a $3 \mu \text{C}$ charge to move it from the negative plate to a positive plate 0.4m away if the field is 100 N/C ?

- A. $1.5 \times 10^{-3} \text{ J}$
B. $2.4 \times 10^{-4} \text{ J}$
C. $7.5 \times 10^{-4} \text{ J}$
D. $12 \times 10^{-4} \text{ J}$

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Which of the following could be relationship between the acceleration, $\vec{a}$ and the displacement x if the particle involve simple harmonic motion.

- $\vec{a} = -6x^2$ B. $\vec{a} = -6x$ C. $\vec{a} = 6x^2$ D. $\vec{a} = 6x$

19. A particle 1, with charge q_1 , and particle 2, with charge q_2 , are on the x axis, with particle 1 at $x = a$ and particle 2 at $x = -2a$. For the net force on a third charged particle q_3 placed at the origin, to be zero, q_2 must be _____.

- A. $-4q_1$ B. $-2q_1$ C. $4q_1$ D. $2q_1$

20. Two charges $Q_1 = +2\mu C$ and $Q_2 = +4\mu C$ are placed at $x = -3$ cm and $x = 3$ cm respectively. What is the direction of electric field at the origin?

- A. to the left B. upward C. to the right D. downward

Part II- Short Answer. Write the precise answer on the space provided on the question paper.

21. An object oscillates with simple harmonic motion along the x axis. Its position varies with time according to the equation $x = \frac{4m}{\pi} \sin(10\pi t)$ where t is in seconds and the angles in the parentheses

are in radians. (3pts) ($\pi \text{ rad} = 180^\circ$)

- A) The maximum acceleration is _____.
- B) The velocity of the motion at $t = 0.2$ s is _____.
- C) The period of oscillation is _____.

Part III- Workout Questions: Show your steps clearly and precisely on the space provided on the question paper.

22. The cross sectional area of water pipe entering the basement is 4cm^2 . The pipe carries water from the basement at a velocity of 6m/s . The pressure at the basement is 300 kPa . What are the speed and pressure in the water when it reaches the 2nd floor which is 8m above the basement if the cross sectional area of a water pipe is half of its value at the basement is 2cm^2 ? (4pts)