

Group A

A. Multiple choice question.

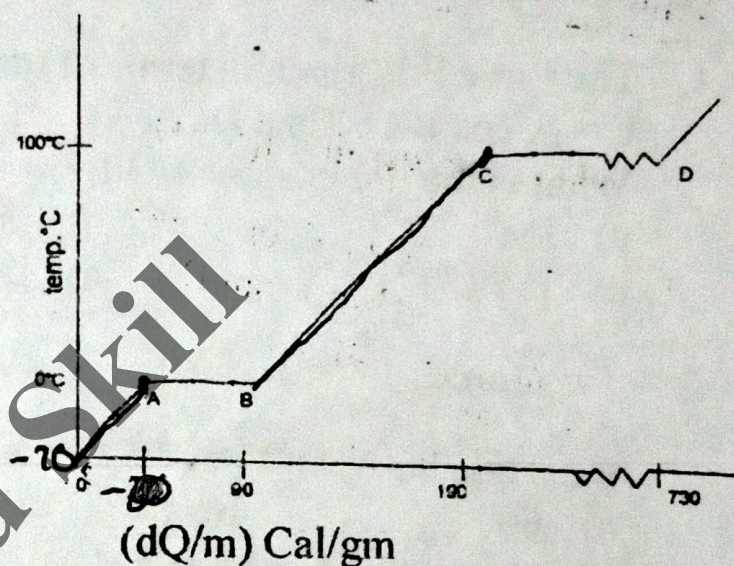
[1×7 = 7]

- The force F is given in terms of time t and displacement x by the equation $F = A \cos Bx + C \sin Dt$
What is the dimension of D/B ?
a) $[M^0 L^1 T^{-1}]$ b) $[M^1 L^1 T^{-1}]$
c) $[M^0 L^1 T^1]$ d) $[M^1 L^0 T^{-1}]$
- Two forces $\vec{F}_1 = 5\hat{i} + 10\hat{j} - 20\hat{k}$ and $\vec{F}_2 = 10\hat{i} - 5\hat{j} - 15\hat{k}$ act on a single point
the angle between \vec{F}_1 and \vec{F}_2 is
a) 60° b) 90° c) 45° d) 30°
- The density of a solid at normal pressure is ρ . When the solid is subjected to an excess pressure P , the density changes to ρ' . If the bulk modulus of the solid is K then the ratio $\frac{\rho'}{\rho}$ is
a) $1 + \frac{P}{K}$ b) $1 + \frac{K}{P}$ c) $\frac{P}{P+K}$ d) $\frac{K}{P+K}$
- Two rods of materials A and B are of same length linear expansivity of A and cubical expansivity of B are $12 \times 10^{-6} \text{ K}^{-1}$ and $3 \times 10^{-5} \text{ K}^{-1}$ respectively. If both the rods are heated from the same temp. to 80°C the length of the rod A will be
a) Large than rod B b) Double than length rod B
c) Equal to length rod B d) Shorter than the length of rod B
- $\gamma_r = \gamma_g + \gamma_a$, where, γ_r is real expansivity of liquid and γ_a is apparent expansivity of liquid for $\gamma_a +ve$ when liquid is heated, the liquid level
a) rises b) falls c) remains same d) can't be predicted
- A concave mirror of focal length f produces an image n times the size of the object. If the image is real then the distance of the object from the mirror is
a) $(n-1)f$ b) $\left(\frac{n-1}{n}\right)f$ c) $\left(\frac{n+1}{n}\right)f$ d) $(n+1)f$
- The ratio of electric force between two electrons to two protons separated by the same distance in air is
a) 10^0 b) 10^6 c) 10^4 d) None

Short questions

8. i) Derive an expression for the force required to make a particle of mass m moving in a circle of radius r with uniform velocity v . [5x5 = 25]
 ii) A particle of mass 2kg travel in a circle of radius 10m at a constant speed of 20m/s what is the magnitude of the acceleration and force? [13]
 9. i) What type of mirror will you suggest for shaving on makeup purpose and why? [2]
 ii) An object 10cm high is placed in front of a convex mirror of focal length 20cm and object is 30cm the mirror. Find the height of the image. [2]
 10. i) Explain, the method of mixture to determine the sp. heat capacity of solid. [3]
 ii) A newly born baby quickly wrapped with cotton cloths why? [2]

11. The graph between temp. vs heat required per unit mass of water is shown in fig below. Study the fig. and answer the following questions.



- a) Write down the temp. and state of water at point A and C. [1]
 b) The slope of OA, is greater than BC, what does it signify? [2]
 c) Calculate the total amount of heat required to convert -20°C 15 gm ice into 100°C steam. [2]
 12. i) Define electric field intensity and derive the expression for electric field intensity due to a point charge. [1+2]
 ii) A charged oil drop remains stationary when situated between two parallel horizontal metal plates between which there is an electric field of intensity $2 \times 10^4 \text{ V/m}$. If mass of the drop is $4.8 \times 10^{-15} \text{ kg}$. Find the number of electrons attached to the drop. [2]

Group C

$$n_1 - n_2 =$$

$$\frac{\text{heat}}{\text{temp}}$$

Long question

13. i) Derive following equations of motion from velocity – time graph. [1x8 = 8]
 a) $v = u + at$ [1]
 b) $S = ut + \frac{1}{2} at^2$ [2]
 c) $v^2 = u^2 + 2as$ [2]
 ii) A body is dropped from the top of the tower of height 60 m at the same time another object is projected vertically upward from the foot of the tower with velocity 20m/s. Find when and where they meet each other. [3]