DEPARTMENT OF SCHOOL EDUCATION

Government JEE Coaching- 2019-20

UNIT TEST- 9

Time: 60min

Marks: 180

Instructions:

1) Answer all the questions

2) For Every correct answer Four marks will be given

3) For Every wrong answer One mark will be deducted

CHOOSE THE CORRECT ANSWER **45x4=180**

1. A wave travelling in positive x direction with A = 0.2m has a velocity of 360m/s if λ= 60m then correct expression for the value

   1) $y=0.2\sin\left[2\pi\left(6t+\frac{x}{60}\right)\right]$ 2) $y=0.2\sin\left[\pi\left(6t+\frac{x}{60}\right)\right]$

   3) $y=0.2\sin\left[2\pi\left(6t-\frac{x}{60}\right)\right]$ 4) $y=0.2\sin\left[\pi\left(6t-\frac{x}{60}\right)\right]$

2. The equation of a wave is given (all quantity in SI units) $y=5\sin 10\pi(t-0.01x)$ along the x axis. The magnitude of phase difference between the points separated by a distance of 10m along x axis is

   1) $\frac{\pi}{2}$ 2) π 3) 2π 4) $\frac{\pi}{4}$

3. The equation of a transverse wave travelling on a rope is given by $y=10\sin\pi(0.01x-2.00t)$ y , x , t where y and x are in cm and t in seconds. The maximum transverse speed of a particle in the rope is about

   1) 63 cm/s 2) 75cm/s 3) 100 cm/s 4) 121 cm/s

4. A transverse periodic wave on a string with a linear mass density of 0.2... kg/m is described by the following equation 0.200 kg/m , $y=0.05\sin(420t-21.0x)$ where x and y are in metres and t is in seconds. The tension in the string is equal to

   1) 32 N 2) 42 N 3) 66 N 4) 80 N

5. Two waves having equations , $x_1=a\sin(wt+\varphi_1)$ $x_2=a\sin(wt+\varphi_2)$ If in the resultant wave the frequency and amplitude remain equal to those of superimposing waves. Then phase difference between them is

   1) $\frac{\pi}{6}$ 2) $\frac{2\pi}{3}$ 3) $\frac{\pi}{4}$ 4) $\frac{\pi}{3}$

6. Two tuning forks when sounded together produced 4 beats/second. The frequency of one fork is 256. The number of beats heard increases when fork of frequency 256 is loaded with wax. The frequency of the other fork is

1) 504 2) 520 3) 260 4) 252

7. A train standing at the outer signal of a railway station blows a whistle of frequency 400 HZ in still air. The train begins to move with the speed of 30 ms^{-1} towards the platform. The frequency of the sound heard by an observe standing on the platform is (Speed of sound in air = 330m/s^{-1})

1) 420 HZ 2) 430 HZ 3) 440 HZ 4) 450 HZ

8. A pipe 17cm long is closed at one end which harmonic mode of the pipe resonates at 1.5KHZ source? (speed of sound in air = 340 ms^{-1})

1) First ₹2) Third 3) Fifth 4) Seventh

9. A graph is drawn with temperature in °C along x axis and °F along y axis. If the graph obtained in a straight line, which of the following is true

1) The line makes an intercept in the + ve x axis

2) The line makes an intercept in the + ve y axis

3) The line passes through the origin

4) The line makes an interscept in both – ve x and y axis

10. A rectangular metallic frame is heated from 0° c 100°c . If the increase in percentage of length is 0.10%, find the increase in its volume in percentage

1) 0.03 % 2) 0.10 % 3) 0.30 % 4) None of these

11. From what height must a block of ice be dropped in order that it may melt completely .It is a assumed that the whole of energy is retained by ice(Latent heat of ice = = 3.33 x 10^5 J/Kg

1) 3.4 x 10^5 m 2) 3.4 x 10^4 m 3) 34 x 10^2 m 4) 34 m

12. Two mole of oxygen gas is mixed with 8 mole of Helium gas. At constant volume, the net specific heat capacity of the mixture is

1) 1.3 R 2) 1.4 R 3) 1.7 R 4) 1.9 R

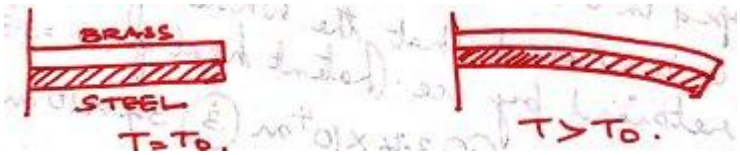
13. 1 kg of water is heated from 40°C If its volume remains constant then the change in internal energy is ----- (specific heat capacity of water = 4148J/kg/k)

1) 2.44 x 10^5 J 2) 1.62 x 10^5 J 3) 1.24 x 10^5 J 4) 2.62 x 10^5 J

14. A solid ball of mass 10kg at 40°c is gently placed in a liquid of mass 20kg at 20°c and of specific heat capacity 1 cal / g °c When the thermal equilibrium is attained temperature of the system is 35°c. The specific heat capacity of the ball is ------ (Neglect the heat capacity of the vessel)

1) 1 cal / g °c 2) 2 cal / g °c 3) 3 cal / g °c 4) 6 cal / g °c

15. In figure, which strip brass or steel have higher coefficient of linear expansion



1) Brass strip
2) Steel strip
3) Both strips have same coefficient of linear expansion
4) Cannot be decided from the given data

16. A 500g toothpaste sample has 0.2g fluoride concentration. What is the concentration of fluoride in terms of ppm level?

1) 250
2) 200
3) 400
4) 1000

17. The amount of oxalic acid (mol.wa 63) required to prepare 500ml of its 0.10N solution is

1) 0.315 g
2) 3.150 g
3) 6.30 g
4) 63.0 g

18. The solubility of gas in liquid increases with

1)Increase in temperature
2) Reduction of gas pressure
3) Amount of liquid taken
4) Decrease in temperature

19. A binary liquid solution is prepared by mixing n–heptane and ethanol. Which one of the following statement is correct regarding behaviour of the solution

1)The solution formed is an ideal solution
2) The solution is non ideal, showing +ve deviation from Raoult's law
3) The solution is non idea, showing –ve deviation from Raoult's law
4) N–Heptane shows +ve deviation while ethanol shows –ve deviation from Raoult's law

20. Which of the following is satisfied by an ideal solution?

1)Formation of an azeotropic mixture
2) ΔS mix= 0
3) Raoult's law is obeyed under particular set of conditions only
4) ΔH mix= 0

21. For which of the following Van'tHoft factor cannot be greater than unity?

1) $K_4[Fe(CN/6)]$
2) $AlCl_3$
3) NH_2CONH_2
4) KNO_3

22. Benzoic acid dissolved in benzene shows

1)Its normal molecular man
2) Double of its normal molecular mass
3) Half of its normal molecular mass
4) Not definite

23. The boiling point of a solution of 0.11g of a substance in 15g of ether was found to be 0.1°C higher than that of pure ether. The molecular weight of the substance will be (Kb= 2.16°C $kgmol^{-1}$

1) 148
2) 168
3)178
4) 158

24. The values of observed and calculated molecular weight of silver nitrate are 92.64and 170 respectively. The degree of dissociation of $AgNo_3$ will be

1) 60 % 2) 83.5 % 3) 46.7 % 4) 60.25 %

25. KBr is 80% dinociated in solution is the freezing point of a 0.5 molal solution is (Kf for water = 1.86° C/m)

1) 273K 2) 277K 3) 269K 4) 271.326K

26. Which inorganic precipitate acts as a semi–permeable membrane

1)Calcium phosphate 2) Nickel phosphate 3) Calcium sulphate 4) Copper ferrocyanide

27. An aqueous solution containing 1g q urea boils at 60.25° C. The agnean solution containing 3g of glucose in the same volume will boil at

1) 100.25° C 2) 100.75° C 3) 100.5° C 4) 100° C

28. If $\propto$ is the degree of dissociation of $NaSO_3$ the Van's Hoff father (i) used for calculating molecular mass is

1) $1+\propto$ 2) $1-\propto$ 3) $1+2\propto$ 4) $1-2\propto$

29. Which has maximum osmotic presume

1) 200 ml of 2M NaCl solution 2) 200 ml of 1M glucose solution

3) 200 ml 2M urea solution 4) All have same

30. The osmotic pressure of 253 ml of a solution dissolving 34.2 g of sugar at 27° C will be

1) 7.12 atm 2) 5.26 atm 3) 3.96 atm 4) 9.73 atm

31. If $x = a\sin 2\theta\,(1+\cos 2\theta)$, $y = b\cos 2\theta\,(1-\cos 2\theta)$, then $\frac{dy}{dx}$

1) $\frac{a}{b}\tan\theta$ 2) $\frac{b}{a}\tan\theta$ 3) $\frac{a}{b}\cot\theta$ 4) $\frac{b}{a}\cot\theta$

32. $X = \frac{1-\sqrt{y}}{1+\sqrt{y}} = > \frac{dy}{dx} =$

1) $\frac{4}{(x+1)^2}$ 2) $\frac{4(x-1)}{(1+x)^3}$ 3) $\frac{x-1}{(1+x)^3}$ 4) $\frac{4}{(x+1)^3}$

33. If $y\sin x = x+y$ then $\frac{dy}{dx}$ at $x = 0$ is

1)1 2) –1 3) 0 4) 2

34. If $y = ((\tan x)^{\tan x})^{\tan x}$ then at $x = \frac{\pi}{4}, \frac{dy}{dx} =$

1) –1 2) 0 3) 1 4) 2

35. If $y = \tan^{-1}\left(\frac{5\cos x - 12\sin x}{12\cos x + 5\sin x}\right)$ then $\frac{dy}{dx} = ?$

1)1 2) –1 3) –2 4) $\frac{1}{2}$

36. The deviation of $\sin^{-1}(3x - 4x^3)$ with respect to $\tan^{-1}\left(\frac{x}{\sqrt{1-x^2}}\right)$ is

1) 0 2) 1 3) 2 4) 3

37. If $Y = e^{\sqrt{x}} + e^{-\sqrt{x}}$ then $xy^{11} + \frac{y^1}{2} = ?$

1) y 2) 4y 3) $\frac{y}{2}$ 4) $\frac{y}{4}$

38. If $X=\frac{2}{t^2}$, $Y=t^3-1$ then $\frac{d^2y}{dx^2}$ =?

1) $15\,t^2$ 2) $\frac{15}{16t^2}$ 3) $\frac{15t^7}{16}$ 4) $16t^2$

39. $y=sin^{-1}x \Rightarrow (1-x^2)\ \frac{d^2y}{dx^2}$ =

1) $-x\frac{dy}{dx}$ 2) 0 3) $x\frac{dy}{dx}$ 4) $x\ (\frac{dy}{dx})^2$

40. The constant 'c' of Rolle's the even for the function $f(x)=(x-a)(x-b)$ is [a,b] is

1) $\sqrt{ab}$ 2) $\frac{a+b}{2}$ 3) $\frac{a-b}{2}$ 4) $\frac{b-a}{2}$

41. Rolle's the even can not applicable for the function

1) $f(x)=x^3-6x^2+11x-6$ in $[1,3]$ 2) $f(x)=\sin x$ in $[0,\pi]$

3) $f(x)=1-(x-1)^{2/3}$ in $[0,2]$ 4) $f(x)=x^2-2x+2$ in $[1,2]$

42. Lagranges theorem can not be applicable for

1) $f(x)\sqrt{x^2-4}$ 2) $f(x)=|x|$ in $[-1,2]$ 3) $f(x)=x-\frac{1}{x}$ is $[1,3]$ 4) $f(x)=\log x$ in $[1,e]$

43. The constant 'c' of Lagranges theorem for $f(x)=\frac{x}{x-1}$ in [2,4] is

1) 1 2) $\sqrt{3}$ 3) $\sqrt{3}+1$ 4) $\sqrt{3}+2$

44. A man is walking at the rate of 8 kmph towards the foot of a tower 60 m high. The rate of which he is approaching the top when he is 8 m from the foot of the tower is

1) 6 km/h 2) 6.4 km/h 3) 7.2 km/h 4) 8km/h

45. A man approaches the foot of a tower of height h units with a speed b units/sec. The speed at which he approaches the vertex of the tower when he is at a distance of ℓ units from the foot is

1) $\frac{b}{\sqrt{h^2+l^2}}$unit/sec 2) $\frac{bl}{\sqrt{h^2+l^2}}$unit/sec 3) $\frac{l}{b\sqrt{h^2+l^2}}$unit/sec 4) None

ANSWER KEY

1	3	16	3	31	2
2	2	17	2	32	2
3	1	18	4	33	2
4	4	19	2	34	4
5	2	20	4	35	2
6	3	21	3	36	4
7	3	22	2	37	4
8	2	23	4	38	3
9	2	24	2	39	3
10	1	25	4	40	2
11	2	26	4	41	3
12	1	27	1	42	2
13	3	28	3	43	3
14	4	29	2	44	2
15	1	30	4	45	2