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Bansal Open Opportunity Scholarship Test

SAMPLE PAPER

Class : XI | ***Time allowed*** **:** 2 hours | ***Maximum Marks*** **:** 240

GENERAL INSTRUCTIONS

1. The question paper consists of **'60'** objective type questions. Each question carry **4** *marks* and all of them are compulsory.
2. Each question contains four alternatives out of which only **ONE** is correct.
3. There is **NEGATIVE** marking. **1 mark** will be deducted for each wrong answer.

[PHYSICS]

Q.1 Given that $ln(\alpha/p\beta) = \alpha z/K_B\theta$ where p is pressure, z is distance, K_B is Boltzmann constant and θ is temperature, the dimensions of β are (useful formula Energy = $K_B \times$ temperature)

(A) $L^0M^0T^0$ (B) $L^2M^0T^0$

(C) $L^1M^{-1}kT^2$ (D) $L^{-1}M^1T^{-2}$

Q.2 At t = 1 sec., a particle is at (1, 0, 0). It moves towards (4, 4, 12) with a constant speed of 65 m/s. The position of the particle is measured in metres and the time in sec. Assuming constant velocity, the position of the particle at t = 3 s is:

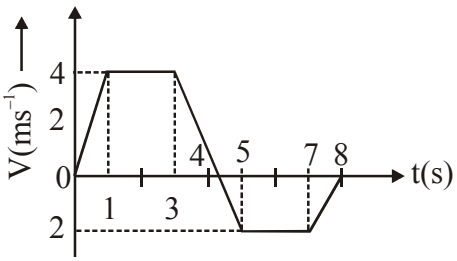
(A) $\left(13\hat{i} - 120\hat{j} + 40\hat{k}\right)$ m

(B) $\left(31\hat{i} + 40\hat{j} + 120\hat{k}\right)$m

(C) $\left(40\hat{i} + 31\hat{j} - 120\hat{k}\right)$m

(D) $\left(13\hat{i} - 40\hat{j} + 12\hat{k}\right)$ m

Q.3 The V–t graph of a rectilinear motion is shown in adjoining figure. The distance from origin after 8 seconds is :



(A) 18 metres (B) 12 metres

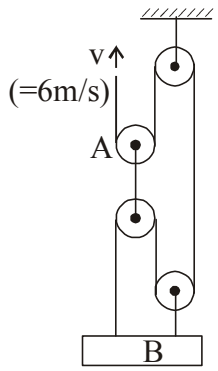
(C) 8 metres (D) 6 metres

Q.4 In a given system of unit standard measurment of mass is 100 gm, standard measurement of length is 200 cm and standard measurement of time is 5 sec. 10 J energy in the given system of unit has value N,then value of N is.

(A) 560 (B) 420

(C) 340 (D) 625

Q.5 In the arrangement shown in figure end 'A' of light inextensible string is pulled with constant velocity v = 6 m/s. The velocity of block 'B' is (in m/s) -

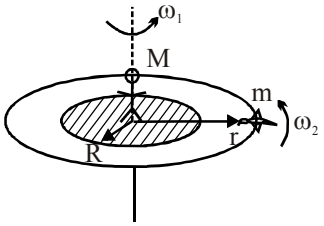


(A) 0001 (B) 0002

(C) 0005 (D) 0007

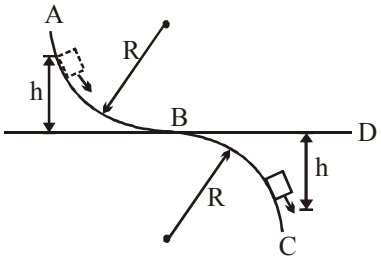
Q.6 An automobile that was moving forward on a highway pulled over onto the exit ramp and slowed to a stop. While the automobile was slowing down, which of the following could be true?
(A) The velocity was positive and the acceleration was positive.
(B) The velocity was negative and the acceleration was negative.
(C) The velocity was positive and the acceleration was negative.
(D) The velocity and acceleration had the same sign, either positive or negative.

Q.7 A man of mass M, standing on a rotating disc (radius R) with angular speed ω_1 as shown, and a mosquito of mass m, revolving with angular speed ω_2 about same axis of rotation at radius r. Then the centrifugal force on mosquito with respect to man is _____ ?



(A) $m\omega_2^2 r$ (B) $m\omega_1^2 r$
(C) $m(\omega_2 - \omega_1)^2 R$ (D) $m\omega_1^2 R$

Q.8 Figure shows a smooth track in a vertical plane, consisting of two circular arcs AB and BC of the same radius R = 2m. The common tangent to the arcs, BD, is horizontal. A small block placed on the track at a height h above BD leaves the track at exactly the same depth below. Determine h in cm.

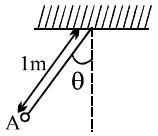


(A) 10 cm (B) 20 cm
(C) 40 cm (D) 80 cm

Q.9 Two masses of 1 gm and 4 gm are moving with equal kinetic energies. The ratio of the magnitudes of their linear momentum is

(A) 4 : 1 (B) $\sqrt{2}$: 1
(C) 1 : 2 (D) 1 : 16

Q.10 A simple pendulum is released from position shown. If the angle θ is small, after what minimum time will the bob be again at A (take $g = \pi^2$)



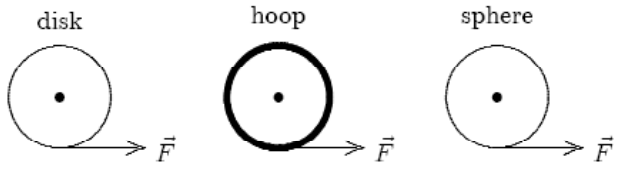
(A) π sec (B) 2π sec
(C) 2 sec (D) 1 sec

Q.11 At t = 0 a flywheel is rotating with angular velocity ω_0. It then undergoes uniform angular acceleration for a time t_1, at the end of which the angular velocity is ω_1. How many revolutions did the flywheel make during this time interval ?

(A) $\frac{1}{2}(\omega_0 + \omega_1)t$ (B) $\frac{\omega_0 t}{2\pi}$

(C) $\frac{\omega_1 t}{2\pi}$ (D) $\frac{(\omega_0 + \omega_1)t}{4\pi}$

Q.12 A uniform disk, a thin hoop, and a uniform sphere, all with the same mass and same outer radius, are each free to rotate about a fixed axis through its center. Assume the hoop is connected to the rotation axis by light spokes. With the objects starting from rest, identical forces are simultaneously applied to the rims, as shown. Rank the objects according to their angular momenta after a given time t, least to greatest.



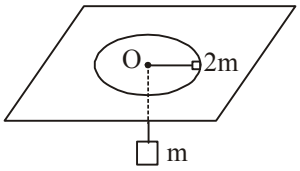
(A) all tie
(B) disk, hoop, sphere
(C) hoop, disk, sphere
(D) hoop, sphere, disk

Q.13 A particle performs uniform circular motion with an angular momentum L. If the frequency of particle's motion is doubled and its kinetic energy is halved, the angular momentum becomes

(A) 2L (B) 4L

(C) L/2 (D) L/4

Q.14 A mass 2m rotating freely in a horizontal circle of radius 1 m on a frictionless smooth table supports a stationary mass m, attached to the other end of the string passing through smooth hole O in table, hanging vertically. Find the angular velocity of rotation.



(A) $\sqrt{5}$ rad / s (B) $2\sqrt{5}$ rad / s

(C) $\sqrt{10}$ rad / s (D) $\frac{\sqrt{5}}{2}$ rad/s

Q.15 Two satellites S_1 and S_2 describe circular orbits of radius r and 2r respectively around a planet. If the orbital angular velocity of S_1 is ω, that of S_2 is:

(A) $\omega/(2\sqrt{2})$ (B) $(\omega\sqrt{2})/3$

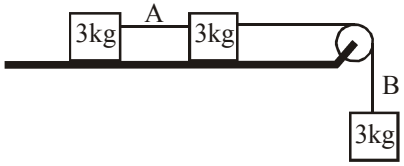
(C) $\omega/2$ (D) $\omega/\sqrt{2}$

Q.16 A stone weighing 1 kg and sliding on horizontal ice with velocity of 2 m/s is stopped by friction in 10 sec. What is the coefficient of friction between stone and ice.

(A) 0.2 (B) 0.1

(C) 0.4 (D) 0.02

Q.17 Three equal masses of 3 kg are connected by two massless strings of cross sectional area 0.005 cm^2 and Young modulus is 2×10^{11} N/m^2 each. The longitudinal strain in the wires



(A) are equal

(B) cannot be different

(C) must be different

(D) may or may not be different

Q.18 Which one of the following is most correct about the temperature and heat ?

(A) Heat and temperature are the same; they just use different numerical scale.

(B) Heat is the energy transferred between the two bodies as a result of differences in their temperatures.

(C) Heat and temperature are not related.

(D) Heat is a measure of the stability of the molecules of the body, and temperature is a measure of the average potential energy of the molecules.

Q.19 If two bodies of water and steam are both at 100°C and have the same mass. They are in contact with our skin, which is likely to cause a more severe burn?

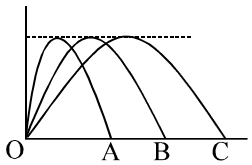
(A) the water

(B) there is no difference

(C) the steam

(D) it depends on the steam's pressure

Q.20 Three projectiles A, B and C are thrown simultaneously from the same point in the same vertical plane. Their trajectories are shown in the figure. Then which of the following statement is **false**.



(A) The time of flight is the same for all the three.

(B) The launch speed is greatest for particle C.

(C) The vertical velocity component for particle C is greater than that for the other particles

(D) Y–coordinate of all particles is always same

Q.21 In two different vessels A and B containing $H_2O(l)$ at the same temperature, the vacant space left over the surface of $H_2O(l)$ is V and 8V. What is the ratio of $(KE)_A$ / $(KE)_B$ of vapour's in two vessels?

(A) $\frac{1}{8}$ (B) $\frac{8}{1}$

(C) $\frac{1}{2}$ (D) $\frac{2}{1}$

Q.22 Which of the following is incorrect?

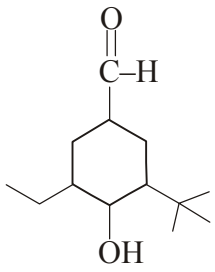
(A) For $A_{(g)} + e^- \rightarrow A^-_{(g)}$ ΔH may be negative

(B) For $A^-_{(g)} + e^- \rightarrow A^{2-}_{(g)}$ ΔH may be negative

(C) For $A^-_{(g)} + e^- \rightarrow A^{2-}_{(g)}$ ΔH must be positive

(D) For $A^{3+}_{(g)} + e^- \rightarrow A^{2+}_{(g)}$ ΔH must be negative

Q.23 Write the IUPAC name for



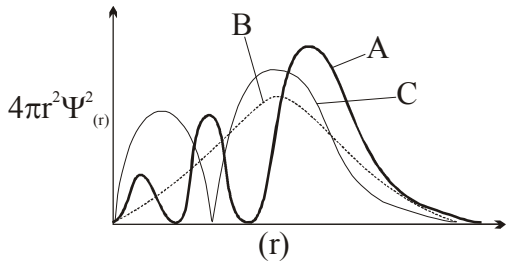
(A) 3-(1,1-Dimethylethyl)-5-ethyl-4-hydroxy cyclohexane carbaldehyde

(B) 3-(1,1-Dimethylethyl)-5-ethyl-4-hydroxy cyclohexanal

(C) 3-Ethyl-4-hydroxy-5-(1,1-dimethylethyl) cyclohexane carbaldehyde

(D) 3-Ethyl-4-hydroxy-5-(1,1-dimethylethyl) cyclohexanal

Q.24 From the graph given below, select the option which correctly matches the orbitals for which the radial probability distribution is given :



(A) A - 3p, B - 3d, C - 3s

(B) A - 3s, B - 3d, C - 4p

(C) A - 4p, B - 3d, C - 5f

(D) A - 3p, B - 4d, C - 4p

Q.25 Which is not the geometry of covalent molecules?

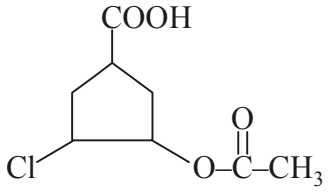
(A) Pentagonal bipyramidal

(B) Tetrahedral

(C) Hexagonal

(D) Octahedral

Q.26 What will be the correct IUPAC name of the following compound?



(A) 3- Ethanoyl oxy-4-Chloro Cyclopentanoic acid

(B) 3- Chloro-4-Ethanoyloxy Cyclopentane Carboxylic acid

(C) 3- Chloro-4-Ethanoyloxy Cyclopentanoic acid

(D) 3- Ethanoyl oxy-4-Chloro Cyclopentane Carboxylic acid

Q.27 What mole percentage of CO_2 in air is just sufficient to prevent loss in weight when $CaCO_3$ is heated at 100°C?

$$CaCO_{3(s)} \rightleftharpoons CaO_{(s)} + CO_{2(g)}$$

$K_P = 0.0095$ atm at 100°C

(A) 2.9% (B) 0.05%

(C) 0.71% (D) 0.95%

Q.28 Which among the following molecules have sp^3d hybridisation with one lone pair electrons on the central atom?

(i) SF_4 (ii) $[PCl_4]^+$

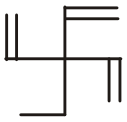
(iii) XeO_2F_2 (iv) $ClOF_3$

(A) (i), (iii) and (iv) only

(B) (i), (ii) and (iii) only

(C) (i) and (iii) only

(D) (iii) and (iv) only

Q.29 Give IUPAC name 

(A) 3,3-Diethenyl pent-1-ene

(B) 3,3-Diethenyl pent-4-ene

(C) 3-Ethenyl-3-ethyl penta-1,4-diene

(D) 3,3,3 Triethenyl propane

Q.30 A gaseous mixture (He and CH_4) has density $\frac{64}{246.3}$ gm/litre at 1 atm & 300 K is kept in a container. Now a pinhole is made on the wall of the container through which He (g) and CH_4(g) effuses. What will be the composition of the gas mixture [$n_{He} : n_{CH_4}$] effusing out initially.

[Take R = 0.0821 atm litre K^{-1} mol^{-1}]

(A) 4 : 1 (B) 8 : 1

(C) 2 : 1 (D) 16 : 1

Q.31 Choose the incorrect options.

(A) N_2H_4 is pyramidal about each atom.

(B) Cl is sp^2 hybridised in ClO_2

(C) The bond angle in OF_2 is lesser than OCl_2

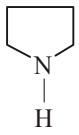
(D) The Be atom in dimer of $BeCl_2$ is sp^3 hybridised.

Q.32 Out of following the most basic isomers of the formula C_4H_7N is

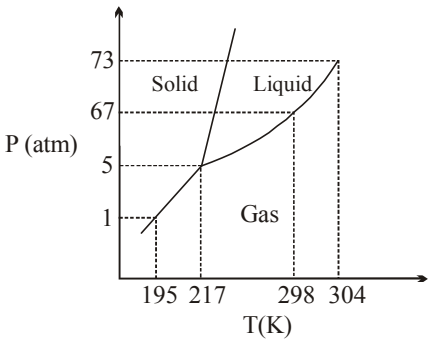
(A) $C\equiv C-C-C-NH_2$

(B) $C-C\equiv C-C-NH_2$

(C) $C-C-C\equiv C-NH_2$

(D) 

Q.33 Phase diagram of CO_2 is shown as following



Based on above find the **correct** statement(s)

(A) 298K is the normal boiling point of liquid CO_2

(B) At 1 atm & 190 K CO_2 will exist as gas.

(C) Sublimation of CO_2(s) can occur at 10 atm pressure and 195K.

(D) Melting point & boiling point of CO_2 will increase on increasing pressure

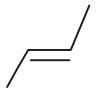
Q.34 Least melting point is shown by the compound.

(A) $SnCl_4$ (B) $PbCl_2$

(C) NaCl (D) $AlCl_3$

Q.35 Which of the isomer of C_4H_8 is most stable.

(A)  (B) 

(C)  (D) 

Q.36 Calculate volume of concentrated HNO_3 required to obtain 60 ml of diluted HNO_3 solution of density 1.4 gm/ml and % w/w = 40% if the concentrated solution has 1.8 gm/ml density and 70% w/w.

(A) 40 ml (B) 270 ml

(C) 33.47 ml (D) 26.67 ml

Q.37 Which of the following process involves the breaking of covalent bond?

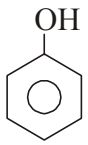
(A) Evaporation of water

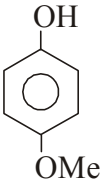
(B) Sublimation of iodine

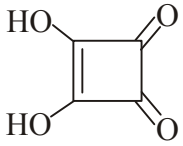
(C) Formation of atomic hydrogen

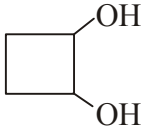
(D) Melting of sodium metal.

Q.38 Which one of the following will give effervesce of CO_2 with $NaHCO_3$.

(A) 

(B) 

(C) 

(D) 

Q.39 One mole of an ideal gas is subjected to a process in which $P = \frac{1}{8.21}V$

(P is pressure in atm, V is volume in litre)

If the pressure gradually increases from initial 1 atm to final 10 atm, then calculate maximum temperature attained during the process.

(A) 10,000K (B) 5000K

(C) 12,000K (D) 600K

Q.40 Which of the following is arranged order of increasing boiling point?

(A) $H_2O < CCl_4 < CS_2 < CO_2$

(B) $CO_2 < CS_2 < CCl_4 < H_2O$

(C) $CS_2 < H_2O < CO_2 < CCl_4$

(D) $CCl_4 < H_2O < CO_2 < CS_2$

Q.41 If $2\sin^2 x + 3\sin x + 1 = 0$ then the sum of all the values of x lying in $[0, 2\pi]$ is $\frac{k\pi}{2}$ where k is

(A) 3 (B) 5
(C) 7 (D) 9

Q.42 If $y^2 + my + 2$ is divided by $y + 1$ or by $y - 1$, the remainder are equal. The value of m, is

(A) 0 (B) 1
(C) 2 (D) -1

Q.43 A rail road curve is to be laid out on a circle. If the track is to change direction by 28^0 in a distance of 44 meters. The radius of the curve (in metre) is (use $\pi = 22/7$)

(A) 30 (B) 45
(C) 60 (D) 90

Q.44 If $\log_2(3\sin x) - \log_2(\cos x) - \log_2(1 - \tan x) - \log_2(1 + \tan x) = 1$, then $\tan x$ is equal to

(A) -2 (B) $\frac{1}{3}$
(C) $\frac{1}{4}$ (D) $\frac{1}{2}$

Q.45 If $P(x) = 3(\sin^4 x + \cos^4 x + 1) - 2(\sin^6 x + \cos^6 x)$ then the value of $P\left(\frac{\pi}{5}\right)$ is equal to

(A) 1 (B) 2
(C) 3 (D) 4

Q.46 The smallest integral value of p for which the inequality $(p - 3)x^2 - 2px + 3(p - 2) > 0$ is satisfied for all real values of x, is

(A) 8 (B) 7
(C) 6 (D) 5

Q.47 The values of $\alpha \in R$ (the set of all real numbers) for which the quadratic equation $3x^2 + 2(\alpha^2 + 1)x + (\alpha^2 - 3\alpha + 2) = 0$ possesses roots of opposite sign, are

(A) $\alpha \in (2, \infty)$ (B) $1 < \alpha < 2$
(C) $1 < \alpha < 3$ (D) $\alpha \in (-\infty, 2)$

Q.48 If α, β are the roots of the equation, $x^2 + (\sin\phi - 1)x - \frac{1}{2}\cos^2\phi = 0$ $(\phi \in R)$, then the maximum value of the sum of the squares of the roots is

(A) 4 (B) 3
(C) $\frac{9}{4}$ (D) 2

Q.49 If x is real, then the least value of the expression $\frac{x^2 - 6x + 5}{x^2 + 2x + 1}$ is

(A) -1 (B) $-1/2$
(C) $-1/3$ (D) none

Q.50 If $\log x = 2\log(x + k)$ where $x \in R^+$ and k is a positive real number then true set of values of k is

(A) $\left(0, \frac{1}{2}\right)$ (B) $\left(0, \frac{1}{4}\right)$
(C) $\left(0, \frac{1}{4}\right]$ (D) $\left(0, \frac{1}{2}\right]$

Q.51 If the equations $2x^2 + \alpha x + \alpha = 0$ and $x^2 + 2x + 2\alpha = 0$ have a common root, then the number of integral values of α is

(A) 1 (B) 2
(C) 3 (D) 4

Q.52 Value of expression $\frac{\sin 3\theta + \sin 5\theta + \sin 7\theta + \sin 9\theta}{\cos 3\theta + \cos 5\theta + \cos 7\theta + \cos 9\theta}$, where $\theta = \frac{\pi}{18}$

(A) 1/3 (B) 1
(C) $\sqrt{3}$ (D) None of these

Q.53 The value of expression $E = \frac{1}{\sin 10^o} - \frac{\sqrt{3}}{\cos 10^o}$ is equal to

(A) 1 (B) 2
(C) 4 (D) $\sqrt{2}$

Q.54 If $\cos\theta = \frac{a}{b+c}$, $\cos\phi = \frac{b}{a+c}$, $\cos\psi = \frac{c}{a+b}$ where $\theta, \phi, \psi \in (0, \pi)$ and a, b, c are sides of triangle ABC then $\tan^2\frac{\theta}{2} + \tan^2\frac{\phi}{2} + \tan^2\frac{\psi}{2}$ is equal to

(A) 1 (B) 2
(C) 3 (D) 4

Q.55 If the equation $|2 - x| - |x + 1| = k$ has exactly one solution, then number of integral values of k is

(A) 7 (B) 5
(C) 4 (D) 3

Q.56 Consider the ten numbers $ar, ar^2, ar^3, \ldots\ldots ar^{10}$. If their sum is 18 and the sum of their reciprocals is 6 then the product of these ten numbers, is

(A) 324 (B) 343
(C) 243 (D) 729

Q.57 Consider the series $r^2 + r^4 + r^6 + r^8 + r^{10} + \ldots\ldots \infty$. The third term is 16 times the fifth term. The sum of the series is

(A) $\frac{1}{4}$ (B) $\frac{1}{3}$

(C) $\frac{1}{2}$ (D) $\frac{4}{3}$

Q.58 In triangle ABC, if $a \sin A \sin B + b\cos^2 A = \sqrt{2}\, a$, then the value of $\left(\frac{b}{a}\right)$ is

(A) $\frac{1}{2}$ (B) 2

(C) $\sqrt{2}$ (D) 1

Q.59 A triangle has sides of length 13, 30 and 37. If the radius of the inscribed circle is $\frac{p}{q}$ (where p and q are coprime), then the value of q^{p+3} is

(A) 2048 (B) 4096
(C) 1024 (D) 512

Q.60 In ΔABC, $b = 2a$ and $|A - B| = \frac{\pi}{3}$, then $\angle C$ equals

(A) $\frac{\pi}{3}$ (B) $\frac{\pi}{2}$

(C) $\frac{2\pi}{3}$ (D) $\frac{5\pi}{6}$