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Knowledge is Discipline
BJNP
Learning with the Speed of Mumbai and the Tradition of Kota

Max. Marks: 200 **Date: 28.11.2022**

JB 2 MR BATCH
PHYSICS : PART TEST (SET B)
Topic: Circular Motion

1. Two identical cars A and B are moving at 36 km/h. A goes on a bridge, convex upward and B on concave upward. The radius of curvature of the bridge is 20 m. The ratio of normal forces exerted on the cars when they are at the middle of bridges is ($g = 10\ m/s^2$)

   (a) 1 : 3 (b) 1 : 2 (c) 2 : 3 (d) 1 : 5

2. A particle suspended by a thread of length l is projected horizontally with a velocity $\sqrt{3gl}$ at the lowest point. The height from the bottom at which the tension in the string becomes zero is

   (a) $\frac{4l}{3}$ (b) $\frac{2l}{3}$ (c) $\frac{5l}{3}$ (d) $\frac{l}{3}$

3. A body is revolving in a vertical circle with constant mechanical energy. the speed of the body at the highest point is $\sqrt{2rg}$. The speed of the body at the lowest point is

   (a) $\sqrt{7gr}$ (b) $\sqrt{6gr}$ (c) $\sqrt{8gr}$ (d) $\sqrt{9gr}$

4. A water bucket of mass ‘m’ is revolved in a verticle circle with the help of a rope of length ‘r’. If the velocity of the bucket at the lowest point is $\sqrt{7gr}$. Then the velocity and tension in the rope at the highest point are

   (a) $\sqrt{3gr}$, 2mg (b) $\sqrt{2gr}$, mg (c) $\sqrt{gr}$, mg (d) Zero, Zero

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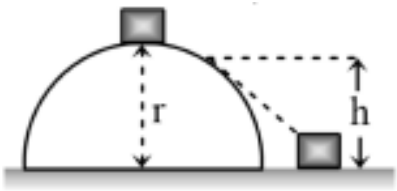
Space for Rough Work

5. A small body of mass m sides down from the top of a hemisphere of radius r. The surface of the block and hemisphere are frictionless. The height at which the body losses contact with the surface of the sphere is

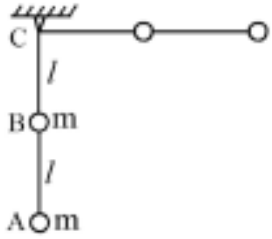


(a) $\sqrt{gr}\ \frac{3}{2}r$ (b) $\frac{2}{3}r$ (c) $\frac{1}{2}gt^2$ (d) $\frac{v^2}{2g}$

6. A person wants to drive on the vertical surface of a large cylindrical wooden 'well' commonly known as 'death well' in a circus. The radius of the well is 2 m, and the coefficient of friction between the tyres of the motorcycle and the wall of the well is 0.2. The minimum speed the motorcyclist must have in order to prevent slipping should be

(a) 10 m/s (b) 15 m/s (c) 20 m/s (d) 25 m/s

7. A weightless rod of length 2I carries two equal masses 'm', one tied at lower end A and the other at the middle of the rod at B. The rod can rotate in a vertical plane about a fixed horizontal axis passing through C. The road is released from rest in a horizontal position. The speed of the mass B at the instant rod become vertical is



(a) $\sqrt{\frac{3gl}{5}}$ (b) $\sqrt{\frac{4gl}{5}}$ (c) $\sqrt{\frac{6gl}{5}}$ (d) $\sqrt{\frac{7gl}{5}}$

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8. A pendulum consists of a wooden bob of mass 'm' and length '*l*'. A bullet of mass m_1 is fired towards the pendulum with speed v_1. The bullet emerges out of the bob with a speed $v_1/3$ and the bob just completes motion along a vertical circle. Find 'v_1'.

(a) $\left(\frac{m}{m_1}\right)\sqrt{5gl}$ (b) $\frac{3}{2}\left(\frac{m}{m_1}\right)\sqrt{5gl}$ (c) $\frac{2}{3}\left(\frac{m_1}{m}\right)\sqrt{5gl}$ (d) $\left(\frac{m_1}{m}\right)\sqrt{gl}$

9. A car turns a corner on a slippery road at constant speed of 12 m/s. If the coefficient of friction is 0.4, the minimum radius of the arc is in metres in which the car turns is

(a) 72 (b) 36 (c) 18 (d) 9

10. A car of mass 1000 kg negotiates a banked curved of radius 90 m on a frictionless road. If the banking angle is 45°, the speed of the car is:

(a) 10 ms^{-1} (b) 20 ms^{-1} (c) 30 ms^{-1} (d) 5 ms^{-1}

11. A car turns a corner on a slippery road at a constant speed of 10 m/s. If the coefficient of friction is 0.5, the minimum radius of the arc in metre in which the car turns is (Giving g = 10 m/s^2)

(a) 20 (b) 10 (c) 5 (d) 4

12. Assuming the coefficient of friction between the road and tyres of a car to be 0.5, the maximum speed with which the car can move round a curve of 40.0 m radius without slipping, if the road is unbanked, should be

(a) 25 m/s (b) 19 m/s (c) 14 m/s (d) 11 m/s

13. A wooden block is placed inside a rotating cylindrical shell of radius 4 m, if the coefficient of friction between shell and block is 0.2, then what should be the angular velocity of the cylinder so that wooden block does not fall? (g = 9.8 m/s^2)

(a) 3.5 rad/s (b) 4.5 rad/s (c) 3.0 rad/s (d) 4.0 rad/s

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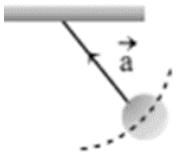
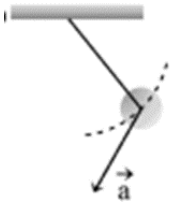
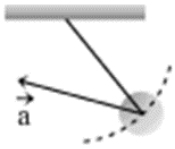
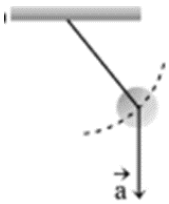
14. A simple pendulum is oscillating without damping. When the displacement of the bob is less than maximum, its acceleration vector $\vec{a}$ is correctly shown in

(a) 

(b) 

(c) 

(d) 

15. Two point size bodies of the same mass are knotted to a horizontal string one at the end, and the other at the midpoint of it. The string is rotated in a horizontal plane with the other end as the center. If T is tension in the string between cetnre of circles and first body then the tension in the string between the two bodies is

(a) $\frac{T}{2}$ (b) $2T$ (c) $\frac{2T}{3}$ (d) $\frac{3T}{2}$

16. A train is moving towards north. At one place it turns towards north-east, here we observe that

(a) The radius of curvature of outer rail will be greater than that of the inner rail

(b) The radius of the inner rail will be greater than that of the outer rail

(c) The radius of curvature of one of the rails will be greater

(d) The radius of curvature of the outer and inner rails will be the same

17. The angular speed of a fly wheel making 120 revolutions/minute is

(a) 2π rad/s (b) $4\pi^2$ rad/s (c) π rad/s (d) 4π rad/s

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18. Certain neutron stars are believed to be rotating at rev/sec. If such a star has a radius of 20 km, the acceleration of an object on the equator of the star will be:

(a) 20×10^8 m/sec^2 (b) 8×10^5 m/sec^2 (c) 120×10^5 m/sec^2 (d) 4×10^8 m/sec^2

19. If a_r and a_t represent radial and tangential accelerations, the motion of a particle will be uniformly circular if:

(a) $a_r = 0$ and $a_t = 0$ (b) $a_r = 0$ but $a_t \neq 0$ (c) $a_r \neq 0$ but $a_t = 0$ (d) $a_r \neq 0$ and $a_t \neq 0$

20. A stone of mass 0.5 kg is attached to a string of length 2 m and is whirled in a horizontal circle. If the string can with stand a tension of 9N, the maximum velocity with which the stone can be whirled is

(a) 6 m/s (b) 8 m/s (c) 4 m/s (d) 12 m/s

21. A particle moves from rest at 'A' on the surface of a smooth circular of radius 'r' as shown. At B it leaves the cylinder. The equation relating α and β is

(a) $3 \sin \alpha = 2 \cos \beta$ (b) $2 \sin \alpha = 3 \cos \beta$

(c) $3 \sin \beta = 2 \cos \alpha$ (d) $2 \sin \beta = 3 \cos \alpha$

22. A stone tied to a string of length L is whirled in a vertical circle with the other end of the string at the centre. At a certain instant of time, the stone is at its lowest position and has a speed u. The magnitude of the change in its velocity as it reaches a position where the string is horizontal is

(a) $\sqrt{u^2 - 2gL}$ (b) $\sqrt{2gL}$ (c) $\sqrt{u^2 - gL}$ (d) $\sqrt{2(u^2 - gL)}$

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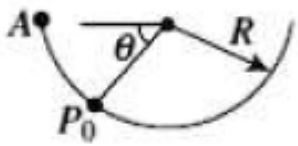
23. The figure shows a smooth vertical circular track AB of radius R. A block slides R. A block slides along the surface AB when it is given a velocity equal to $\sqrt{6gR}$ art point A. The ratio of the force exerted by the track on the block at point A to that at point B is

(a) 0.25 (b) 0.35 (c) 0.45 (d) 0.55

24. A 2 kg stone is swinging in a vertical circle by attaching it at the end of a string of length 2 m. If the string can withstand a tension of 140.6 N, the maximum speed with which the stone can be roated is

(a) 22 ms^{-1} (b) 44 ms^{-1} (c) 33 ms^{-1} (d) 11 ms^{-1}

25. A bead of mass m is released from rest at A to move along the fixed smooth circular track as shown in figure. The ratio of magnitudes of centripetal force and normal reaction by the track on the bead at any point P_0 described by the angle $\theta(\neq 0)$ would



(a) Increase with θ (b) Decrease with θ

(c) Remain constant (d) First increase with θ and then decrease

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Date: 28.11.2022

JB 2 MR BATCH
CHEMISTRY : PART TEST (SET B)
Topic: Chemical Bonding + Mole Concept + Periodic Properties

26. Lowest ionization potential in a period is shown by:

(a) alkali metals (b) halogens

(c) transition elements (d) alkaline earth metals

27. The lowest ionization energy would be associated with the electronic structure:

(a) $1s^2, 2s^2, 2p^6, 3s^1$ (b) $1s^2, 2s^2, 2p^5$

(c) $1s^2, 2s^2, 2p^6$ (d) $1s^2, 2s^2, 2p^6, 3s^2\ 3p^2$

28. The reaction, $H_2S + H_2O_2 = S + 2H_2O$ manifests:

(a) oxidizing action of H_2O_2 (b) reducing nature of H_2O_2

(c) acidic nature of H_2O_2 (d) alkaline nature of H_2O_2

29. In $Ni(CO)_4$, the oxidation state of Ni is:

(a) 4 (b) zero (c) 2 (d) 8

30. In which of the following reactions the underlined substance is oxidized?

(a) $3Mg + \underline{N_2} = Mg_3N_2$ (b) $2KI + \underline{Br_2} = 2KBr + I_2$

(c) $\underline{CuO} + H_2 = Cu + H_2O$ (d) $\underline{CO} + Cl_2 = COCl_2$

31. For compounds,

(A) Tetracyanoethene (B) Carbon dioxide (C) Benzene (D) 1, 3-Butadiene

Ratio of σ and π-bonds is in order:

(a) A = B < C < D (b) A = B < D < C (c) A = B = C = D (d) C < D < A < B

32. Among the following which species has same number of σ and π-bonds?

(a) C_7H_8 (b) $C_2(CN)_4$ (c) C_2H_4 (d) $HC \equiv CH$

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33. The number and type of bonds between two carbon atoms in CaC_2 are:
(a) one sigma (σ) and one pi (π) bond
(b) one sigma (σ) and two pi (π) bonds
(c) one sigma (σ) and one and a half pi (π) bond
(d) one sigma (σ) bond

34. Compounds formed by sp^3d^2-hybridization will have configuration:
(a) square planar
(b) octahedral
(c) trigonal bipyramidal
(d) pentagonal bipyramidal

35. A molecule in which sp^2-hybrid orbitals are used by the central atom in forming covalent bond is:
(a) H_2 (b) SO_2 (c) PCl_5 (d) N_2

36. In which of the following molecules/ions are all the bonds not equal?
(a) BF_4^- (b) SF_4 (c) SiF_4 (d) XeF_4

37. The hybridization of orbitals of N atoms in NO_3^-, NO_2^+ and NH_4^+ are respectively:
(a) sp, sp^2, sp^3 (b) sp^2, sp, sp^3 (c) sp, sp^3, sp^2 (d) sp^2, sp^3, sp

38. The pair having similar geometry is:
(a) BF_3, NF_3 (b) BF_3, AlF_3 (c) BeF_2, H_2O (d) BCl_3, PCl_3

39. Molecular shape of SF_4, CF_4 and XeF_4 are:
(a) The same with 2, 0 and 1 lone pair of electrons respectively
(b) The same with 1, 1 and 1 lone pair of electrons respectively
(c) Different with 0, 1 and 2 lone pairs of electrons respectively
(d) Different with 1, 0 and 2 lone pairs of electrons respectively

40. The first ionization potential of Na, Mg, Al and Si are in the order:
(a) Na < Mg > Al < Si
(b) Na > Mg > Al > Si
(c) Na > Mg < Al > Si
(d) Na > Mg > Al < Si

41. Carbon atoms in $C_2(CN)_4$ are:
(a) sp-hybridised
(b) sp^2-hybridised
(c) sp- and sp^2-hybridised
(d) sp, sp^2 and sp^3-hybridised

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42. OF_2 is:

(a) linear molecule and sp-hybridized (b) tetrahedral molecule and sp^3-hybridized

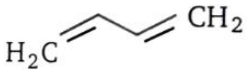
(c) bent molecule and sp^3-hybridized (d) none of the above

43. The hybridization of carbon atoms in C–C single bond of $HC \equiv C - Ch = CH_2$ is:

(a) $sp^3 - sp^3$ (b) sp^2-sp^3 (c) sp-sp^2 (d) sp^3-sp

44. Which of the following represents the given mode of hybridization $sp^2 - sp^2 - sp - sp$ from left to right?

(a) $H_2C = CH - C \equiv N$ (b) $HC \equiv C - C \equiv CH$

(c) $H_2C = C = C \equiv CH_2$ (d) 

45. The correct hybridization state of sulphur atom in SF_2, SF_4 and SF_6 molecules is respectively:

(a) sp^3d, sp^3, sp^3d^2 (b) sp^3, sp^3d, sp^3d^2 (c) sp^3d^2, sp^3, sp^3d (d) sp^3d^2, sp^3d, sp^3

46. What is the hybridization of As in AsF_4^- ion?

(a) sp (b) sp^2 (c) sp^3 (d) sp^3d

47. The hybridization of P in phosphate ion (PO_4^{3-}) is the same as in:

(a) I in ICl_4^- (b) S in SO_3 (c) N in NO_3^- (d) S in SO_3^{2-}

48. sp^2-hybridization is shown by:

(a) $BeCl_2$ (b) BF_3 (c) NH_3 (d) XeF_3

49. In which molecule sulphur atom is not sp^3-hybridized?

(a) SO_4^2 (b) SF_4 (c) SF_2 (d) None

50. In the compound $\overset{1}{C}H_2 = \overset{2}{C}H = \overset{3}{C}H_2 - \overset{4}{C}H_2 - \overset{5}{C} \equiv \overset{6}{C}H$, the $\overset{2}{C} - \overset{3}{C}$ bond is of the type:

(a) sp-sp^2 (b) sp^3-sp^3 (c) sp-sp^3 (d) sp^2-sp^3

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JB 2 MR BATCH
PHYSICS : PART TEST (SET B) ANSWER KEY
Topic: Circular Motion

1.	(a)	2.	(a)	3.	(b)	4.	(a)	5.	(b)
6.	(a)	7.	(c)	8.	(b)	9.	(b)	10.	(c)
11.	(a)	12.	(c)	13.	(a)	14.	(c)	15.	(c)
16.	(a)	17.	(d)	18.	(b)	19.	(c)	20.	(a)
21.	(c)	22.	(d)	23.	(d)	24.	(d)	25.	(c)

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JB 2 MR BATCH
CHEMISTRY : PART TEST (SET B) ANSWER KEY
Topic: Chemical Bonding + Mole Concept + Periodic Properties

26.	(a)	27.	(a)	28.	(a)	29.	(b)	30.	(d)
31.	(a)	32.	(b)	33.	(b)	34.	(b)	35.	(b)
36.	(b)	37.	(b)	38.	(b)	39.	(d)	40.	(a)
41.	(c)	42.	(c)	43.	(c)	44.	(a)	45.	(b)
46.	(d)	47.	(d)	48.	(b)	49.	(b)	50.	(d)