

**BJNP***Learning with the Speed of Mumbai and the Tradition of Kota***Max. Marks: 60****Date: 27.11.2022**

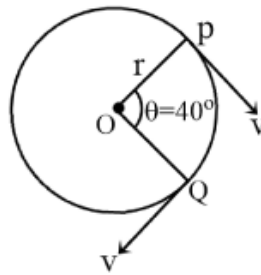
JB 2 MR BATCH
PHYSICS : DCT (SET A)
Topics: Circular Motion

1. A plane is revolving around the earth with a speed of 100 km/h at a constant height from the surface of the earth. The change in the velocity as it travels half-circle is
(a) 200 km/h (b) 150 km/h (c) $100\sqrt{2}$ km/h (d) 0
2. An object is projected obliquely at an angle θ to the horizontal with a certain velocity. During its path of trajectory, what is the ratio of minimum to maximum radii of turning?
(a) $1 : \cos^2 \theta$ (b) $\cos^2 \theta : 1$ (c) $\cos^3 \theta : 1$ (d) $1 : \cos^3 \theta$
3. An object is moving along a curved path for which its acceleration is $(2\hat{i} + \hat{j})$ m/s² and its velocity is $(\hat{i} - 3\hat{j})$ m/s at an instant. The body is
(a) speeding up (b) speeding down
(c) moving with uniform velocity (d) moving with uniform acceleration
4. Two cars going round curve with speeds one at 90 km/h and other at 15 km/h. Each car experiences same acceleration. The radii of curves are in the ratio of
(a) 4 : 1 (b) 2 : 1 (c) 16 : 1 (d) 36 : 1
5. The linear velocity of a rotating body is given by $\vec{V} = \vec{\omega} \times \vec{r}$, where $\vec{\omega}$ is the angular velocity and \vec{r} is the radius vector. The angular velocity of a body is $\vec{\omega} = \hat{i} - 2\hat{j} + 2\hat{k}$ and the radius vector $\vec{r} = 4\hat{j} - 3\hat{k}$ then $|\vec{v}|$ is
(a) $\sqrt{29}$ units (b) $\sqrt{31}$ units (c) $\sqrt{37}$ units (d) $\sqrt{41}$ units

Space for Rough Work



6. A body is moving in a circle with a speed of 1 m/s. This speed increases at a constant rate of 2 m/s every second. Assume that the radius of the circle described is 25 m. The total acceleration of the body after 2 s is
 (a) 2 ms^{-2} (b) 25 ms^{-2} (c) $\sqrt{5} \text{ ms}^{-2}$ (d) $\sqrt{7} \text{ ms}^{-2}$
7. A particle is moving on a circular path of radius 'r' with uniform speed 'v'. The change in velocity when the particle moves from P to Q is ($\angle POQ = 40^\circ$)



- (a) $2v \cos 40^\circ$ (b) $2v \sin 40^\circ$ (c) $2v \sin 20^\circ$ (d) $2v \cos 20^\circ$
8. A particle moves in a circle of radius 25 cm at 2 revolutions/s. The acceleration of the particle in m/s^2 is
 (a) π^2 (b) $8\pi^2$ (c) $4\pi^2$ (d) $2\pi^2$
9. A stone tied to the end of a string 100 cm long is whirled in a horizontal circle with a constant speed. If the stone makes 14 revolutions in 22s, then the acceleration of the stone is x
 (a) 16 ms^{-2} (b) 4 ms^{-2} (c) 12 ms^{-2} (d) 8 ms^{-2}
10. The magnitude of displacement of a particle moving in a circle of radius a with constant angular speed ω varies with time t is
 (a) $2a \sin \omega t$ (b) $2a \sin \frac{\omega t}{2}$ (c) $2a \cos \omega t$ (d) $2a \cos \frac{\omega t}{2}$

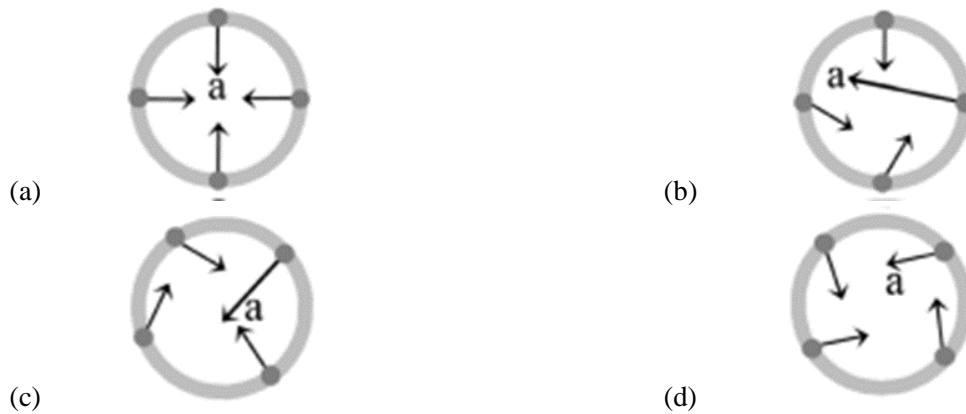
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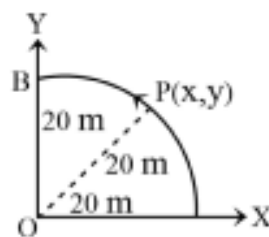
11. A car of mass m moves in a horizontal circular path of radius r metre. At an instant its speed is V m/s and is increasing at a rate of a ms^{-2} . Then the acceleration of the car is

(a) $\frac{V^2}{r}$ (b) a (c) $\sqrt{a^2 + \left(\frac{V^2}{r}\right)^2}$ (d) $\sqrt{a + \frac{V^2}{r}}$

12. A car speeds up in a circular path Moving in anticlockwise direction. Which of the following figures illustrates the net acceleration of the car?



13. A point P moves in a counter-clockwise direction on a circular path as shown in the figure. The movement of P is such that it sweeps out a length $s = t^3 + 5$, where s is in metre and t is in seconds. The radius of the path is 20 m. The magnitude acceleration of P at $t = 2$ s is:

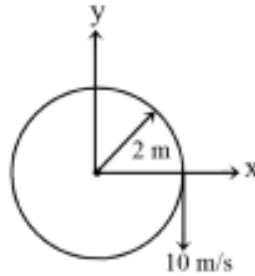


- (a) 14 ms^{-2} (b) 13 ms^{-2} (c) 12 ms^{-2} (d) 7.2 ms^{-2}

Space for Rough Work



14. A particle is moving along a circular path in the XY plane. When it crosses the x-axis, it has an acceleration along the path of 1.5 m/s^2 , and is moving with a speed of 10 m/s in the negative y-direction. The total acceleration of the particle is:



- (a) $50\hat{i} - 1.5\hat{j} \text{ m/s}^2$ (b) $-50\hat{i} - 1.5\hat{j} \text{ m/s}^2$ (c) $10\hat{i} - 1.5\hat{j} \text{ m/s}^2$ (d) $1.5\hat{i} - 50\hat{j} \text{ m/s}^2$
15. A particle A moves along a circle of radius of $R = 50 \text{ cm}$ so that its radius vector r relative to the point O rotates with the constant angular velocity $\omega = 0.40 \text{ rad/s}$. Then speed of the particle, and the modulus of its total acceleration will be



- (a) $v = 0.4 \text{ m/s}$, $a = 0.4 \text{ m/s}^2$ (b) $v = 0.4 \text{ m/s}$, $a = 0.32 \text{ m/s}^2$
 (c) $v = 0.2 \text{ m/s}$, $a = 0.08 \text{ m/s}^2$ (d) changing for both v and w w.r.t. time

Space for Rough Work



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**JB 2 MR BATCH
CHEMISTRY : DCT (SET A)**

Topic: Chemical Bonding + Periodic Properties + Mole Concept

16. According to periodic law of elements, the variation in properties of elements is related to their:

(a) atomic number	(b) atomic mass
(c) nuclear mass	(d) neutron-proton ratio
17. Which set represents isoelectronic species?

(a) Be, Al^{3+} , Cl^-	(b) Ca^{2+} , Cs^+ , Br	(c) Na^+ , Ca^{2+} , Mg^{2+}	(d) N^{3-} , F^- , Na^+
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18. In the periodic table the size of atoms across a period:

(a) decreases from right to left	(b) increases from left to right
(c) increases from right to left	(d) does not change
19. The pair of elements which on combination are most likely to form an ionic compound is:

(a) Na and Ca	(b) K and O_2	(c) O_2 and Cl_2	(d) Al and I_2
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20. The correct order of the lattice energies of the following ionic compounds is:

(a) $\text{NaCl} > \text{MgBr}_2 > \text{CaO} > \text{Al}_2\text{O}_3$	(b) $\text{Al}_2\text{O}_3 > \text{MgBr}_2 > \text{CaO} > \text{NaCl}$
(c) $\text{MgBr}_2 > \text{Al}_2\text{O}_3 > \text{CaO} > \text{NaCl}$	(d) $\text{Al}_2\text{O}_3 > \text{CaO} > \text{MgBr}_2 > \text{NaCl}$
21. Which has a giant covalent structure?

(a) PbO_2	(b) SiO_2	(c) NaCl	(d) AlCl_3
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22. Octet rule is not valid for the molecule:

(a) CO_2	(b) NO	(c) O_2	(d) PCl_3
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23. Hypervalent compound is:

(a) IF_7	(b) NH_3	(c) BeF_2	(d) CH_4
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24. Which of the following is not isoelectronic to others?

(a) NO^-	(b) CN^-	(c) N_2	(d) O_2^{2+}
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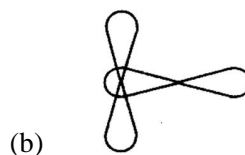
Space for Rough Work



25. Strongest bond is formed by the head on overlapping of:

- (a) 2s- and 2p- orbitals (b) 2p- and 2p-orbitals
(c) 2s- and 2s-orbitals (d) all of these

26. Which p-orbital overlapping would give the strongest bond?



27. Number of sigma bonds in P_4O_{10} is:

- (a) 6 (b) 7 (c) 17 (d) 16

28. A sp^3 -hybrid orbital contains:

- (a) $1/4$ s-character (b) $1/2$ s-character (c) $2/3$ s-character (d) $3/4$ s-character

29. Oxidation number of fluorine in F_2O is:

- (a) +1 (b) +2 (c) -1 (d) -2

30. $Cl_2 + H_2S \rightarrow 2HCl + S$,

In the above reaction, oxidation state of chlorine changes from:

- (a) zero to -1 (b) 1 to zero (c) zero to 1 (d) remains unchanged

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PHYSICS : DCT (SET A) ANSWER KEY
Topics: Circular Motion

1.	(a)	2.	(c)	3.	(b)	4.	(d)	5.	(a)
6.	(c)	7.	(c)	8.	(c)	9.	(a)	10.	(b)
11.	(c)	12.	(d)	13.	(a)	14.	(b)	15.	(b)

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CHEMISTRY : DCT (SET A) ANSWER KEY
Topic: Chemical Bonding + Mole Concept + Periodic Properties

16.	(a)	17.	(d)	18.	(c)	19.	(b)	20.	(d)
21.	(b)	22.	(b)	23.	(a)	24.	(a)	25.	(b)
26.	(c)	27.	(d)	28.	(a)	29.	(c)	30.	(a)