

Max. Marks: 60

(a)

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

- 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) $\sqrt{7} \text{ ms}^{-2}$
- 2. 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 ($\angle POQ = 40^\circ$)



 $2v \cos 40^{\circ}$ (b) $2v \sin 40^{\circ}$ (c) $2v \sin 20^{\circ}$ (d) $2v \cos 20^{\circ}$

3. 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) $2\pi^2$

- 4. 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}
- 5. 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) $2a \cos \frac{\omega t}{2}$

Space for Rough Work

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- 6. 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) $\sqrt{a + \frac{V^2}{r}}$
- 7. A car speeds up in a circular path Moving in anticlockwise direction. Which of the following figures illustrates the net acceleration of the car?



8. 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:



Space for Rough Work



9. 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) $1.5\hat{i} - 50\hat{j}\,\text{m/s}^2$

10. A particle A moves along a circle of radius of R = 50 cm so that its radius vector r relative to the point O rotates with the constant angular velocity $\omega = 0.40$ 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

11. 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√2 km/h	(d)	0
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12. 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) $1:\cos^3 \theta$

13. An object is moving along a curved path for which its acceleration is $(2\hat{i} + \hat{j}) \text{ m/s}^2$ and its velocity is $(\hat{i} - 3\hat{j}) \text{ m/s}^2$ at an instant. The body is

- (a) speeding up (b) speeding down
- (c) moving with uniform velocity (d) moving with uniform acceleration

14. 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

15. 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



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

16.	The correct order of the lattice energies of the following ionic compounds is:									
	(a)	$NaCl > MgBr_2 > 0$	CaO > A	l_2O_3	(b)	$Al_2O_3 > MgBr_2 > C$	aO > Na	Cl		
	(c) $MgBr_2 > Al_2O_3 > CaO > NaCl$		JaCl	(d)	$Al_2O_3 > CaO > MgBr_2 > NaCl$					
17.	Hypervalent compound is:									
	(a)	\mathbf{IF}_7	(b)	NH ₃	(c)	BeF ₂	(d)	CH_4		
18.	In the periodic table the size of atoms across a period:									
	(a)	decreases from rig	ght to lef	Ì	(b)	increases from left to right				
	(c)	increases from rig	ht to left	t	(d)	does not change				
19.	Which of the following is not isoelectronic to others?									
	(a)	NO ⁻	(b)	CN^{-}	(c)	N_2	(d)	O_2^{2+}		
20.	Strongest bond is formed by the head on overlapping of:									
	(a)	2s- and 2p- orbitals				2p- and 2p-orbitals				
	(c)	2s- and 2s-obritals	8		(d)	all of these				
21.	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		
22.	Numb	er of sigma bonds ir	n P4O10 i	s:						
	(a)	6	(b)	7	(c)	17	(d)	16		
23.	Which	has a giant covalen	ıt structu	ire?						
	(a)	PbO ₂	(b)	SiO ₂	(c)	NaCl	(d)	AlCl ₃		



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

	(a)									
	(c)	\bigcirc	\sim	1	(d)	\bigcirc				
25.	Octet	rule is not valid for	the mole	ecule:						
	(a)	CO_2	(b)	NO	(c)	O ₂	(d)	PCl ₃		
26.	A sp ³ -	hybrid orbital conta	ains:							
	(a)	1/4 s-character	(b)	1/2 s-character	(c)	2/3 s-character	(d)	3/4 s-character		
27.	The pa	he 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		
28.	Oxida	tion number of fluo	orine in F	² 2O is:						
	(a)	+1	(b)	+2	(c)	-1	(d)	-2		
29.	$Cl_2 + l$	$H_2S \rightarrow 2HCl + S,$								
	In the	above reaction, oxi	dation st	ate of chlorine chang	ges from:					
	(a)	zero to -1	(b)	1 to zero	(c)	zero to 1	(d)	remains unchanged		
30.	Accor	ding to periodic law	v of elem	ents, the variation in	properti	es of elements is rela	ted to th	eir:		
	(a)	atomic number			(b)	atomic mass				
	(c)	nuclear mass			(d)	neutron-proton rati	0			
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JB 2 MR BATCH PHYSICS : DCT (SET B) ANSWER KEY Topics: Circular Motion

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

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