JB 1 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/s^2 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) $\sqrt{5}$ ms⁻²   (d) $\sqrt{7}$ 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 ($\angle POQ = 40°$)
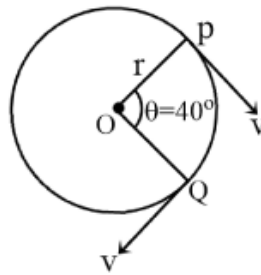
    (a) 2v cos 40°   (b) 2v sin 40°   (c) 2v sin 20°   (d) 2v cos 20°

8. A particle moves in a circle of radius 25 cm at 2 revolutions/s. The acceleration of the particle in m/s² 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 ωt   (b) 2a sin $\dfrac{\omega t}{2}$ (c) 2a cos ωt   (d) 2a cos $\dfrac{\omega t}{2}$
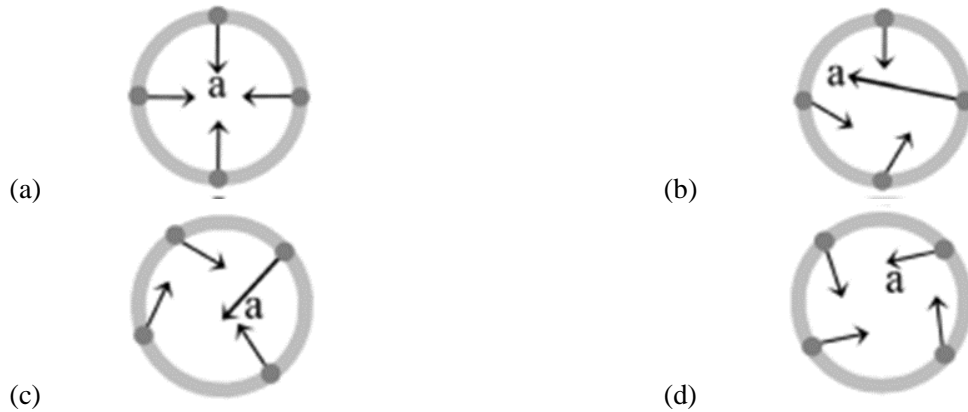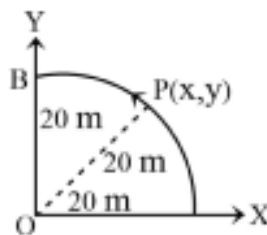
Space for Rough Work

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) $\dfrac{V^2}{r}$

(b) a

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

(d) $\sqrt{a + \dfrac{V^2}{r}}$

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?

(a)

(b)

(c)

(d)

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:
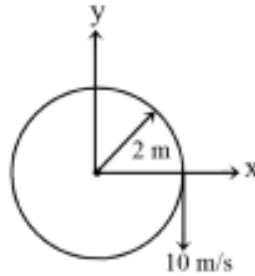
(a) 14 ms^{-2}

(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 cm so that its radius vector r relative to the point O rotates with the constant angular velocity ω = 0.40 rad/s. Then speed of the particle, and the modulus of its total acceleration will be

    (a)   v = 0.4 m/s, a = 0.4 m/s^2 (b)   v = 0.4 m/s, a = 0.32 m/s^2

    (c)   v = 0.2 m/s, a = 0.08 m/s^2 (d)   changing for both v and w w.r.t. time

Space for Rough Work

Max Marks: 60   **Date: 27.11.2022**
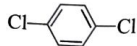
JB 1 MR BATCH
CHEMISTRY : DCT (SET A)
Topic: Chemical Bonding + Mole Concept + Periodic Properties

16.   Which statement(s) is (are) wrong for bond angle?

   (a) $CH \equiv CH > BF_3 > CH_4$ (b) $H_2O > NH_3$

   (c) $\overset{\oplus}{N}H_4 > NH_3 > PCl_5$ (d) $CO_2 > NH_3 > CH_4$

17.   Which statement(s) is (are) correct for AB_x type molecule?

   (a)   If the EN of central atom decreases, the bond angle decreases.

   (b)   If the size of central atom increases, the bond angle decreases.

   (c)   If the EN of atom B decreases that bond angle increases.

   (d)   If the EN of atom B decreases, the bond angle decreases.

18.   Paramagnetic pair(s) among the following is (are)

   (a) $[BaO_2, NO_2]$ (b) $[KO_2, NO]$

   (c) $[H_2O_2, NO]$ (d) $K_3[Fe(CN)_6], CuCl_2$

19.   Which of the following statements is incorrect?

   (a) NH_3 is more basic than PH_3.

   (b) NH_3 has a higher boiling point than that of HF.

   (c) N_2 is less reactive than P_4.

   (d)   The dipole moment of NH_3 is less than that of SO_2.

20.   If one assumes linear structure instead of bent structure for water, then which one of the following properties cannot be explained?

   (a)   The formation of intermolecular hydrogen bond in water.

   (b)   The high boiling point of water.

   (c)   Solubility of polar compounds in water.

   (d)   Ability of water to form coordinate covalent bond.

Space for Rough Work

21. The EN's of F, Cl, Br and I are 4.0, 3.0, 2.8 and 2.5 respectively. The hydrogen halide with a highest percentage of ionic character is

(a) HI   (b) HBr   (c) HCl   (d) HF

22. Among the following which is polar?

(a) CO_2 (b) SO_2 (c) $BeCl_2$ (d) Cl—⬡—Cl

23. The resultant dipole moment (μ) of two compounds NOF and NO_2F is 1.81 D and 0.47 D respectively. Which dipole moment do you predict?

(a) 1.81 D for NO_2F and 0.47 D for NOF

(b) 0.47 D for NO_2F and 1.81 D for NOF

(c) For both NO_2F and NOF, dipole moment (μ) is 1.81 D

(d) For both NO_2F and NOF, dipole moment (μ) is 0.47 D

24. Which of the following molecule(s) have dipole moment?

I.   Trans-pent-2-ene

II. cis-hex-3-ene

III. 2, 2-Dimethyl propane

IV. 2, 2, 3, 3-tetramethyl butane

(a) I, II   (b) II, III   (c) I, III   (d) I, IV

25. The shapes of $PCl_4^{\oplus}$, $PCl_4^{\ominus}$ and $AsCl_5$ are respectively

(a) Square planar, tetrahedral and see-saw.

(b) Tetrahedral, see-saw and trigonal bipyramidal.

(c) Tetrahedral, square planar and pentagonal bipyramidal.

(d) Trigonal bipyramidal, tetrahedral and square pyramidal.

26. How many moles of O_2 will be liberated by one mole of CrO_5 is the following reaction:

$CrO_5 + H_2SO_4 \rightarrow Cr_2(SO_4)_3 + H_2O + O_2$

(a) 4.5   (b) 2.5   (c) 1.25   (d) None

Space for Rough Work

27. 1 mol of MnO_4^{2-} in neutral aqueous medium dis-propertionates to

(a) $\frac{2}{3}$ mol of $MnO_4^{\ominus}$ and $\frac{1}{3}$ mol of MnO_2

(b) $\frac{1}{3}$ mol of $MnO_4^{\ominus}$ and $\frac{2}{3}$ mol of MnO_2

(c) $\frac{1}{3}$ mol of Mn_2O_7 and $\frac{2}{3}$ mol of MnO_2

(d) $\frac{2}{3}$ mol of Mn_2O_7 and $\frac{1}{3}$ mol of MnO_2

28. If equal volumes of 1 M $KMnO_4$ and 1M $K_2Cr_2O_7$ solutions are used to oxidise Fe^{2+} in acidic medium, then Fe^{2+} will be oxidised

(a) More by $K_2Cr_2O_7$

(b) More by $KMnO_4$

(c) Equal in both the cases

(d) The data is insufficient to predict the answer

29. An atom with high EA generally has

(a) Tendency to form +ve ions

(b) High ionization energy

(c) Large atomic size

(d) Low electron affinity

30. Due to screening effect of electrons in an atom

(a) IE decreases

(b) IE increases

(c) No change in IE

(d) Attraction of nucleus on the valence electron increases

* * * * *

Space for Rough Work

Max. Marks: 60   **Date: 27.11.2022**

JB 1 MR BATCH
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)

Max Marks: 60   **Date: 27.11.2022**

JB 1 MR BATCH
CHEMISTRY : DCT (SET A) ANSWER KEY
Topic: Chemical Bonding + Mole Concept + Periodic Properties

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