Max Marks: 60 **Date: 19.08.2022**

JB 1 MR BATCH
CHEMISTRY: DCT
Topic: Mole Concept

1. 2.7 g of Ag_2CO_3 on being heated strongly yields a residue weighing
   (a) 2.11 g (b) 2.48 g (c) 2.32 g (d) 2.64 g

2. If 1 mole of ethanol (C_2H_5OH) completely burns to CO_2 and H_2O, the weight of CO_2 formed is about.
   (a) 22 g (b) 45 g (c) 66 g (d) 88 g

3. Calculate the weight of iron which will be converted into its oxide by the action of 18 g of steam on it. From the reaction $2_{Fe} + 3H_2O \rightarrow Fe_2O_3 + 3H_2$.
   (a) 37.3 gm (b) 3.73 gm (c) 56 gm (d) 5.6 gm

4. A 10.0 g sample of a mixture of calcium chloride and sodium chloride is treated with Na_2CO_3 to precipitate the calcium as calcium carbonate. This $CaCO_3$ is heated to convert all the calcium to CaO and the final mass of CaO is 1.62 gms. The % by mass of $CaCl_2$ in the original mixture is :
   (a) 15.2% (b) 32.1% (c) 21.8% (d) 11.07%

5. A mixture of KBr and NaBr weighing 0.560 gm was treated with aqueous Ag^+ and all the bromide inon was recovered as 0.970 gm of pure AgBr. The weight of KBr in the sample is
   (a) 0.25 gm (b) 0.212 (c) 0.36 (d) 0.285

6. 2.4 kg of carbon is made to react with 1.35 kg of aluminium to form Al_4C_3. The maximum amount in kg of aluminium carbide formed is
   (a) 5.4 (b) 3.75 (c) 1.05 (d) 1.8

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7. Consider the reaction 2A → 2B, B → 2C, 3C → 4D. The no. of moles of D formed starting 4 moles of A, are

(a) 8 (b) 16 (c) 4 (d) 10.67

8. If 0.5 mole of $BaCl_2$ is mixed with 0.2 mole of Na_3PO_4, the maximum number of moles of $Ba_3(PO_4)_2$ that can be formed is

(a) 0.7 (b) 0.5 (c) 0.30 (d) 0.10

9. For the reaction A + 2B → C + 3D, 5 moles of A and 8 moles of B will produce

(a) 5 moles of C (b) 4 moles of C (c) 8 moles of C (d) None of these

10. 3.0 molal NaOH solution has a density of 1.11 g/ml. The molarity of the solution is

(a) 2.97 (b) 3.05 (c) 3.64 (d) 3.050

11. The mole fraction of NaCl in a solution containing 1 mole of NaCl in 1000 g water is

(a) 0.0177 (b) 0.001 (c) 0.5 (d) 1.5

12. If half mole of oxygen combine with Al to form Al_2O_3, the weight of Al used in the reaction is

(a) 27 g (b) 40.5 g (c) 54 g (d) 18 g

13. One mole of potassium chlorate is thermally decomposed and excess of aluminium is burnt in the gaseous product. How many mole of aluminium oxide are formed:

(a) 1 (b) 1.5 (c) 2 (d) 3

14. The density of a 3.60M sulphuric acid solution that is 29% H_2SO_4 (molar mass 98 mol^{-1}) by mass will be :

(a) 1.22 (b) 1.45 (c) 1.64 (d) 1.88

15. How many gms copper (at. wt = 64) would be displaced from the copper sulphate solution by adding 27 gm of aluminium (at. wt = 27)

(a) 32 (b) 64 (c) 96 (d) 160

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JB 1 MR BATCH
MATHEMATICS : DCT
Topic: Trigonometry

16. If $\tan A = \frac{a}{a+1}$ and $\tan B = \frac{a}{2a+1}$, then the value of A + B is

(a) 0 (b) $\frac{\pi}{2}$ (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{4}$

17. If tan A – tan B = x and cot B – cot A = y, then cot (A – B) =

(a) $\frac{1}{x}+y$ (b) $\frac{1}{xy}$ (c) $\frac{1}{x}-\frac{1}{y}$ (d) $\frac{1}{x}+\frac{1}{y}$

18. $\cos^2 48^\circ - \sin^2 12^\circ =$

(a) $\frac{\sqrt{5}-1}{4}$ (b) $\frac{\sqrt{5}+1}{8}$ (c) $\frac{\sqrt{3}-1}{4}$ (d) $\frac{\sqrt{3}+1}{2\sqrt{2}}$

19. $\sin 10^\circ + \sin 20^\circ + \sin 30^\circ + \ldots + \sin 360^\circ$ is equal to

(a) 0 (b) 1 (c) –1 (d) $\frac{1}{2}$

20. $\cos 1^\circ + \cos 2^\circ + \cos 3^\circ + \ldots + \cos 180^\circ =$

(a) 0 (b) 1 (c) –1 (d) 2

21. If $\text{tna}A = \frac{1}{2}, \tan B = \frac{1}{3}$, then cos 2A =

(a) sin B (b) sin 2B (c) sin 3B (d) –sin 2B

22. If ABCD is a cyclic quadrilateral, then cos A + cos B is equal to

(a) 0 (b) cos C + cos D (c) – (cos C + cos D) (d) cos C – cos D

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23. The value of $\sin^2\frac{\pi}{8}+\sin^2\frac{3\pi}{8}+\sin^2\frac{5\pi}{8}+\sin^2\frac{7\pi}{8}$ is

(a) 1 (b) 2 (c) $\frac{3}{8}$ (d) $\frac{1}{8}$

24. $\cos 20^\circ \cos 40^\circ \cos 80^\circ =$

(a) $\frac{1}{2}$ (b) $\frac{1}{4}$ (c) $\frac{1}{6}$ (d) $\frac{1}{8}$

25. $\sqrt{2+\sqrt{2+2\cos 4\theta}} =$

(a) $\cos\theta$ (b) $\sin\theta$ (c) $2\cos\theta$ (d) $2\sin\theta$

26. If $\tan\beta = \cos\theta\tan\alpha$, then $\tan^2\frac{\theta}{2} =$

(a) $\frac{\sin(\alpha+\beta)}{\sin(\alpha-\beta)}$ (b) $\frac{\cos(\alpha-\beta)}{\cos(\alpha+\beta)}$ (c) $\frac{\sin(\alpha-\beta)}{\sin(\alpha+\beta)}$ (d) $\frac{\cos(\alpha+\beta)}{\cos(\alpha-\beta)}$

27. If $x+\frac{1}{x}=2\cos\theta$, then $x^3+\frac{1}{x^3}=$

(a) $\cos 3\theta$ (b) $2\cos 3\theta$ (c) $\frac{1}{2}\cos 3\theta$ (d) $\frac{1}{3}\cos 3\theta$

28. $\sin(45^\circ + A)\sin(45^\circ - A) =$

(a) $\cos A$ (b) $\frac{1}{2}\cos 2A$ (c) $\cos 2A$ (d) $\frac{1}{2}\cos A$

29. $\sin 18^\circ \sin 70^\circ + \sin 16^\circ \sin 36^\circ =$

(a) $\frac{1}{8}$ (b) $\frac{1}{16}$ (c) $\frac{\sqrt{3}}{8}$ (d) $\frac{\sqrt{3}}{16}$

30. The value of $\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ$ is equal to

(a) $\frac{1}{16}$ (b) $\frac{3}{16}$ (c) $\frac{\sqrt{3}}{16}$ (d) $\frac{\sqrt{3}}{32}$

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CHEMISTRY : DCT ANSWER KEY
Topic: Mole Concept

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

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JB 1 MR BATCH
MATHEMATICS : DCT ANSWER KEY
Topic: Trigonometry

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