

MM : 120

Class-XII JEE

TIME : 60 MINUTES

NOTE: There are three sections, Physics, Chemistry and Maths.  
Each section carries 10 questions with four marks each and all are compulsory.

**PHYSICS**

01. Given below are two statements:

**Statement I:** An AC circuit undergoes electrical resonance if it contains either a capacitor or an inductor.

**Statement II:** An AC circuit containing a pure capacitor or a pure inductor consumes high power due to its non-zero power factor. In the light of above statements, choose the correct answer from the options given below:

- (1) Statement I is false but statement II is true  
(2) Statement I is true but statement II is false  
(3) Both Statement I and Statement II are false  
(4) Both Statement I and Statement II are true

02. The distance between two plates of a capacitor is
- $d$
- and its capacitance is
- $C_1$
- , when air is the medium between the plates. If a metal sheet of thickness
- $2d/3$
- and of the same area as plate is introduced between the plates, the capacitance of the capacitor becomes
- $C_2$
- . The ratio
- $C_2 / C_1$
- is

- (1) 3:1                      (2) 2:1  
(3) 4:1                      (4) 1:1

03. In a metallic conductor, under the effect of applied electric field, the free electrons of the conductor

- (1) Drift from higher potential to lower potential  
(2) Move with the uniform velocity throughout from lower potential to higher potential  
(3) Move in the straight line paths in the same direction  
(4) Move in the curved paths from lower potential to higher potential

04. The source of time varying magnetic field may be

- (A) a permanent magnet  
(B) an electric field changing linearly with time  
(C) direct current  
(D) a decelerating charge particle  
(E) an antenna fed with a digital signal

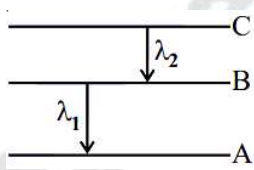
Choose the correct answer from the options given below.

- (1) (C) and (E) only  
(2) (D) only  
(3) (A) only  
(4) (B) and (D) only

05. A proton with a kinetic energy
- $2eV$
- moves into a region of uniform magnetic field of magnitude
- $\pi/2 \times 10^{-2}$
- T. The angle between the direction of magnetic field and velocity of proton is
- $60^\circ$
- . The pitch of the helical path taken by the proton is...

( Take, mass of proton =  $1.6 \times 10^{-27}$  kg and charge on proton =  $1.6 \times 10^{-19}$  C)

SKD  
NEW  
STANDARD  
COACHING  
INSTITUTE**ROUGH WORK**

- (1) 20 cm                      (2) 50 cm  
(3) 40 cm                      (4) 100 cm
06. In a reflecting telescope, a secondary mirror is used to:
- (1) reduce the problem of mechanical support  
(2) make chromatic aberration zero  
(3) move the eyepiece outside the telescopic tube  
(4) remove spherical aberration
07. Two convex lenses of focal length 20cm each are placed coaxially with a separation of 60cm between them. The image of the distant object formed by the combination is at \_\_\_\_\_ from the first lens.
- (1) 80cm                      (2) 100cm  
(3) 50cm                      (4) 40cm
08. A single slit of width  $a$  is illuminated by a monochromatic light of wavelength 600 nm. The value of ' $a$ ' for which first minimum appears at  $\theta = 30^\circ$  on the screen will be :
- (1)  $0.6 \mu\text{m}$                       (2)  $1.2 \mu\text{m}$   
(3)  $1.8 \mu\text{m}$                       (4)  $3 \mu\text{m}$
09. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R
- Assertion A:** EM waves used for optical communication have longer wavelengths than that of microwave, employed in Radar technology.
- Reason R:** Infrared EM waves are more energetic than microwaves, (used in Radar)
- In the light of given statements, choose the correct answer from the options given below.
- (1) Both A and R are true but R is NOT the correct explanation of A  
(2) A is false but R is true  
(3) A is true but R is false  
(4) Both A and R are true and R is the correct explanation of A
10. As per given figure A, B and C are the first, second and third excited energy levels of hydrogen atom respectively. If the ratio of the two wavelengths (i.e.  $\frac{\lambda_1}{\lambda_2}$ ) is  $7/4n$ , then value of  $n$  will be
- 
- (1) 3                      (2) 4  
(3) 5                      (4) 6

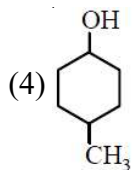
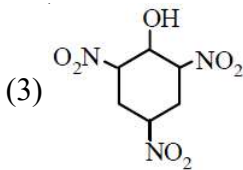
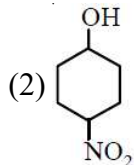
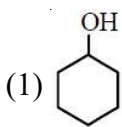
S  
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W  
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C  
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E

**CHEMISTRY**

11. 0.5 molal aqueous solution of a weak acid (HX) is 20% ionised. If  $K_f$  for water is  $1.86 \text{ K kg mol}^{-1}$ , the lowering in freezing point of the solution is:
- (1) 0.56 K                      (2) 1.12 K  
(3) -0.56 K                      (4) -1.12 K
12. The compound  $\text{C}_7\text{H}_8$  undergoes the following reactions:
- $$\text{C}_7\text{H}_8 \xrightarrow{3\text{Cl}_2/\Delta} \text{A} \xrightarrow{\text{Br}_2/\text{Fe}} \text{B} \xrightarrow{\text{Zn}/\text{HCl}} \text{C}$$
- Find the compound C
- (1) m-bromotoluene  
(2) o-bromotoluene  
(3) 3-bromo-2, 4, 6-trichlorotoluene  
(4) p-bromotoluene

**ROUGH WORK**

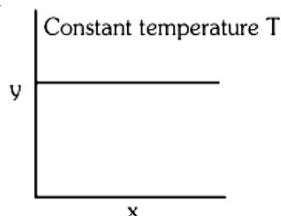
13. Which one is the most acidic compound?



14. The molar conductances ( $\Lambda_m^\circ$ ) at infinite dilution of NaCl, HCl and  $\text{CH}_3\text{COONa}$  are 126.4, 425.9 and  $91.0 \text{ S cm}^2 \text{ mol}^{-1}$  respectively. ( $\Lambda_m^\circ$ ) for  $\text{CH}_3\text{COOH}$  will be:

- (1)  $425.45 \text{ S cm}^2 \text{ mol}^{-1}$  (2)  $180.5 \text{ S cm}^2 \text{ mol}^{-1}$   
 (3)  $290.8 \text{ S cm}^2 \text{ mol}^{-1}$  (4)  $390.5 \text{ S cm}^2 \text{ mol}^{-1}$

15. The given graph is a representation of kinetics of a reaction.



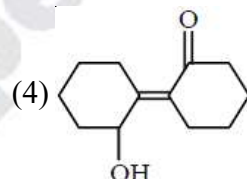
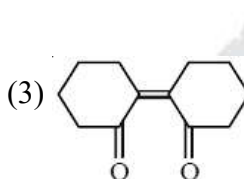
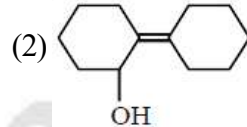
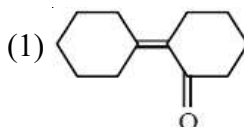
The y and x axes for zero and first order reactions, respectively are

- (1) zero order ( $y = \text{concentration}$  and  $x = \text{time}$ ),  
 first order ( $y = t_{1/2}$  and  $x = \text{concentration}$ )  
 (2) zero order ( $y = \text{concentration}$  and  $x = \text{time}$ ),  
 first order ( $y = \text{rate constant}$  and  $x = \text{concentration}$ )  
 (3) zero order ( $y = \text{rate}$  and  $x = \text{concentration}$ ),  
 first order ( $y = t_{1/2}$  and  $x = \text{concentration}$ )  
 (4) zero order ( $y = \text{rate}$  and  $x = \text{concentration}$ ),  
 first order ( $y = \text{rate}$  and  $x = t_{1/2}$ )

16. When neutral or faintly alkaline  $\text{KMnO}_4$  is treated with potassium iodide, iodide ion is converted into 'X'. 'X' is:

- (1)  $\text{I}_2$  (2)  $\text{IO}_4^-$   
 (3)  $\text{IO}_3^-$  (4)  $\text{IO}^-$

17. Of the following, which is the product formed when cyclohexanone undergoes aldol condensation followed by heating?



18. Match List-I with List-II.

**List-I**

- (a)  $[\text{Fe}(\text{CN})_6]^{3-}$   
 (b)  $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$   
 (c)  $[\text{Fe}(\text{CN})_6]^{4-}$   
 (d)  $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$

**List-II**

- (i) 5.92 BM  
 (ii) 0 BM  
 (iii) 4.90 BM  
 (iv) 1.73 BM

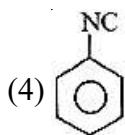
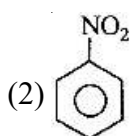
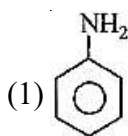
Choose the correct answer from the options given below.

- (1) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)  
 (2) (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii)  
 (3) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)  
 (4) (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii)

19.  $\text{A} \xrightarrow{\text{reduction}} \text{B} \xrightarrow{\text{CHCl}_3/\text{KOH}} \text{C} \xrightarrow{\text{reduction}}$

N-methylaniline,

The compound A is



20. Sucrose on hydrolysis gives  
 (1)  $\beta$ -D-Glucose +  $\alpha$ -D-Fructose  
 (2)  $\alpha$ -D-Glucose +  $\beta$ -D-Glucose  
 (3)  $\alpha$ -D-Glucose +  $\beta$ -D-Fructose  
 (4)  $\alpha$ -D-Fructose +  $\beta$ -D-Fructose

**MATHS**

21. If  $f: R \rightarrow R$  be a function defined by

$$f(x) = \frac{x^2 - 8}{x^2 + 2}, \text{ then } f \text{ is}$$

- (1) one-one but not onto  
 (2) one-one and onto  
 (3) onto but not one-one  
 (4) neither one-one nor onto
22. If  $\tan^{-1}(\cot \theta) = 2\theta$ , then  $\theta$  is equal to  
 (1)  $\frac{\pi}{3}$  (2)  $\frac{\pi}{4}$   
 (3)  $\frac{\pi}{6}$  (4) None of these
23. The order of the single matrix obtained from

$$\begin{bmatrix} 1 & -1 \\ 0 & 2 \\ 2 & 3 \end{bmatrix} \left\{ \left[ \begin{array}{ccc} -1 & 0 & 2 \\ 2 & 0 & 1 \end{array} \right] - \left[ \begin{array}{ccc} 0 & 1 & 23 \\ 1 & 0 & 21 \end{array} \right] \right\}$$

- (1)  $2 \times 3$  (2)  $2 \times 2$   
 (3)  $3 \times 2$  (4)  $3 \times 3$

24. Find the value of  $x$ , for which  $\det A$  vanishes,

$$\text{where } A = \begin{bmatrix} x+1 & -1 & 0 \\ 2 & x+4 & 0 \\ 0 & 0 & x \end{bmatrix}$$

- (1)  $0, -2, -3$  (2)  $0, -2, 3$   
 (3)  $0, 2, -3$  (4)  $0, 2, 3$

25. The value of  $b$  for which the function  $f(x) = \sin x - bx + c$  is decreasing for  $x \in R$  is given by

- (1)  $b < 1$  (2)  $b \geq 1$   
 (3)  $b > 1$  (4)  $b \leq 1$

26. If  $\int \frac{dx}{(x+2)(x^2+1)} = a \log|1+x^2| + b \tan^{-1} x + \frac{1}{5} \log|x+2| + C$ , then

- (1)  $a = \frac{-1}{10}, b = \frac{-2}{5}$  (2)  $a = \frac{1}{10}, b = -\frac{2}{5}$   
 (3)  $a = \frac{-1}{10}, b = \frac{2}{5}$  (4)  $a = \frac{1}{10}, b = \frac{2}{5}$

27. The area bounded by  $x = |y|$  and line  $x = 2$ , is  
 (1) 4 sq. units (2) 5 sq. units  
 (3) 1 sq. units (4) 3 sq. units

28. The differential equation satisfied by  $y = \frac{A}{x} + B$  is ( $A, B$  are parameters)

S  
K  
D  
N  
E  
W  
S  
T  
A  
N  
D  
A  
R  
D  
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U  
T  
E

**ROUGH WORK**

- (1)  $x^2y_1 = y$                       (2)  $xy_1 + 2y_2 = 0$   
 (3)  $xy_2 + 2y_1 = 0$                 (4) none of these

29. If  $\vec{a}, \vec{b}$  and  $\vec{c}$  are three vectors such that  
 $\vec{a} + \vec{b} + \vec{c} = 0$  and  $|\vec{a}| = 2, |\vec{b}| = 3, |\vec{c}| = 5$ ,  
 then the value of  $\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a}$  is

- (1) 0                                      (2) 1  
 (3) -19                                  (4) 38

30. The vector equation of the symmetrical form of equation of straight line

$$\frac{x-5}{3} = \frac{y+4}{7} = \frac{z-6}{2} \text{ is}$$

- (1)  $\vec{r} = (3\hat{i} + 7\hat{j} + 2\hat{k}) + \mu(5\hat{i} + 4\hat{j} - 6\hat{k})$   
 (2)  $\vec{r} = (5\hat{i} + 4\hat{j} - 6\hat{k}) + \mu(3\hat{i} + 7\hat{j} + 2\hat{k})$   
 (3)  $\vec{r} = (5\hat{i} - 4\hat{j} - 6\hat{k}) + \mu(3\hat{i} - 7\hat{j} - 2\hat{k})$   
 (4)  $\vec{r} = (5\hat{i} - 4\hat{j} + 6\hat{k}) + \mu(3\hat{i} + 7\hat{j} + 2\hat{k})$

ROUGH WORK