

# JEE Main 2024 Mock Test 6

Time Allotted: 3 Hours

Maximum Marks: 300

- Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.

## **Important Instructions:**

1. The test is of 3 hours duration.
  2. This test paper consists of 90 questions. Each subject (PCM) has 30 questions. The maximum marks are 300.
  3. This question paper contains **Three Parts. Part-A** is Physics, **Part-B** is Chemistry and **Part-C** is Mathematics. Each part has only two sections: **Section-A and Section-B**.
  4. **Section – A** : Attempt all questions.
  5. **Section – B** : Do any 5 questions out of 10 Questions.
  6. **Section-A (01 – 20)** contains 20 multiple choice questions which have **only one correct answer**. Each question carries **+4 marks** for correct answer and **–1 mark** for wrong answer.
  7. **Section-B (1 – 10)** contains 10 Numerical based questions. The answer to each question is rounded off to the nearest integer value. Each question carries **+4 marks** for correct answer and **–1 mark** for wrong answer.
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# PART - A (PHYSICS)

## SECTION - A

(One Options Correct Type)

This section contains **20 multiple choice questions**. Each question has **four choices** (A), (B), (C) and (D), out of which **ONLY ONE** option is correct.

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- Q1.** If the distance of the earth from sun is  $1.5 \times 10^6$  km. Then the distance of an imaginary planet from Sun, if its period of revolution is 2.83 years is :
- (A)  $6 \times 10^6$  km (B)  $3 \times 10^6$  km  
(C)  $6 \times 10^7$  km (D)  $3 \times 10^7$  km

- Q2.** Let  $\gamma_1$  be the ratio of molar specific heat at constant pressure and molar specific heat at constant volume of a monoatomic gas and  $\gamma_2$  be the similar ratio of diatomic gas. Considering the diatomic gas molecule as a rigid rotator, the ratio,  $\frac{\gamma_1}{\gamma_2}$  is :

(A)  $\frac{27}{35}$

(B)  $\frac{35}{27}$

(C)  $\frac{25}{21}$

(D)  $\frac{21}{25}$

- Q3.** Given below are two statements : one is labelled as **Assertion A** and other is labelled as **Reason R**

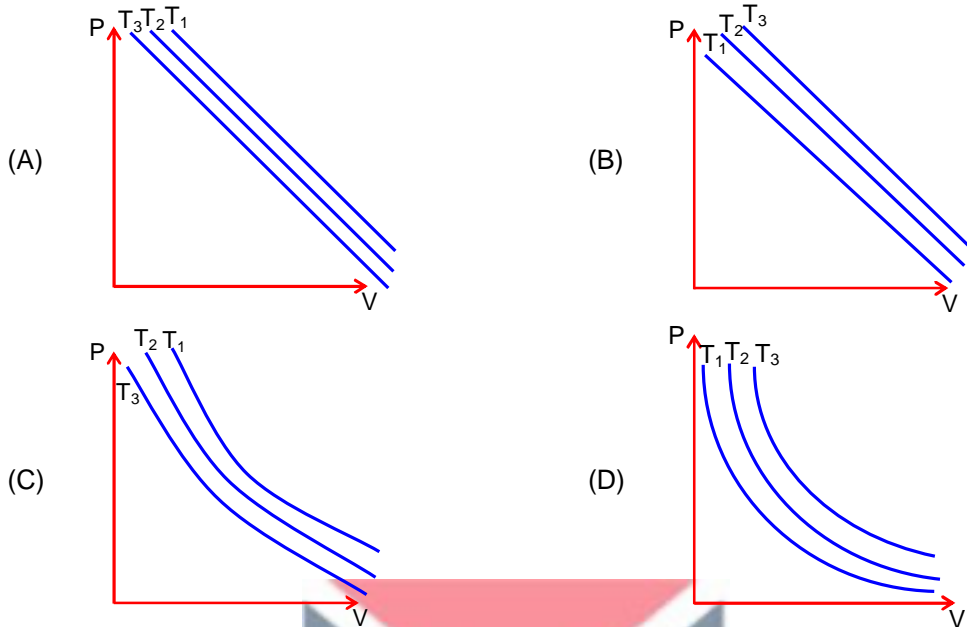
**Assertion A** : Steel is used in the construction of buildings and bridges.

**Reason R** : Steel is more elastic and its elastic limit is high.

In the light of above statements, choose the most appropriate answer from the given below

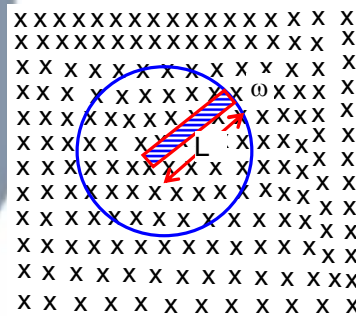
- (A) Both **A** and **R** are correct and **R** is the correct explanation of **A**  
(B) Both **A** and **R** are correct but **R** is **NOT** the correct explanation of **A**  
(C) **A** is not correct but **R** is correct  
(D) **A** is correct but **R** is not correct
- Q4.** When a beam of white light is allowed to pass through convex lens parallel to principal axis, the different colours of light converge at different point on the principle axis after refraction. This is called :
- (A) Scattering (B) Spherical aberration  
(C) Polarisation (D) Chromatic aberration
-

**Q5.** In an Isothermal change, the change in pressure and volume of a gas can be represented for three different temperature :  $T_3 > T_2 > T_1$  as :



**Q6.** An metallic rod of length 'L' is rotated with an angular speed of ' $\omega$ ' normal to a uniform magnetic field 'B' about an axis passing through one end of rod as shown in figure. The induced emf will be :

- (A)  $\frac{1}{2}BL^2\omega$
- (B)  $\frac{1}{4}BL^2\omega$
- (C)  $\frac{1}{4}B^2L\omega$
- (D)  $\frac{1}{2}B^2L^2\omega$



**Q7.** If two vectors  $\vec{P} = \hat{i} + 2\hat{j} + m\hat{k}$  and  $\vec{Q} = 4\hat{i} - 2\hat{j} + m\hat{k}$  are perpendicular to each other. Then, the value of m will be :

- (A) -1
- (B) 2
- (C) 1
- (D) 3

**Q8.** Given below are two statements : one is labelled as **Assertion A** and the other is labelled as **Reason R**.

**Assertion A :** A pendulum clock when taken to Mount Everest becomes fast.

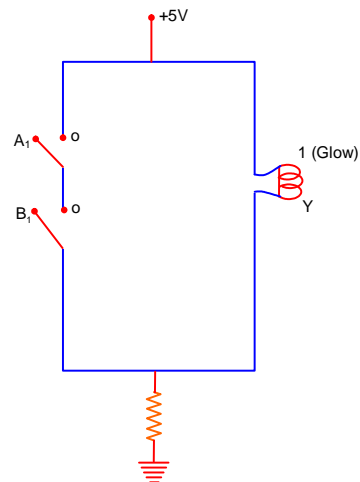
**Reason R :** The value of g (acceleration due to gravity) is less at Mount Everest than its value on the surface of earth.

In the light of the above statements. choose the most appropriate answer from the options given below

- (A) **A** is correct but **R** is not correct
- (B) **A** is not correct but **R** is correct
- (C) Both **A** and **R** are correct and **R** is the correct explanation of **A**
- (D) Both **A** and **R** are correct but **R** is **NOT** the correct explanation of **A**

- Q9.** An  $\alpha$ -particle, a proton and an electron have the same kinetic energy. Which one of the following is correct in case of their de-Broglie wavelength :
- (A)  $\lambda_{\alpha} < \lambda_p < \lambda_e$  (B)  $\lambda_{\alpha} > \lambda_p < \lambda_e$   
 (C)  $\lambda_{\alpha} = \lambda_p = \lambda_e$  (D)  $\lambda_{\alpha} > \lambda_p > \lambda_e$

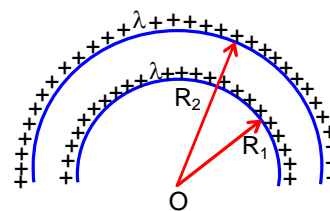
- Q10.** The logic gate equivalent to the given circuit diagram is :
- (A) OR  
 (B) NOR  
 (C) NAND  
 (D) AND



- Q11.** The electric potential at the centre of two concentric half rings of radii  $R_1$  and  $R_2$ , having same linear charge density  $\lambda$  is :

(A)  $\frac{\lambda}{4 \epsilon_0}$   
 (C)  $\frac{\lambda}{\epsilon_0}$

(B)  $\frac{2\lambda}{\epsilon_0}$   
 (D)  $\frac{\lambda}{2 \epsilon_0}$



- Q12.** A cell of emf 90V is connected across series combination of two resistors each of  $100\Omega$  resistance. A voltmeter of resistance  $400\Omega$  is used to measure the potential difference across each resistor. The reading of the voltmeter will be :
- (A) 40 V (B) 80 V  
 (C) 90 V (D) 45 V

- Q13.** A body of mass 200g is tied to a spring constant 12.5 N/m, while the other end of spring is fixed at point O. If the body moves about O in a circular path on a smooth horizontal surface with constant angular speed 5 rad/s. Then the ratio of extension in the spring to its natural length will be :
- (A) 2 : 5 (B) 1 : 1  
 (C) 1 : 2 (D) 2 : 3

- Q14.** The frequency ( $\nu$ ) of an oscillating liquid drop may depend upon radius ( $r$ ) of the drop, density ( $\rho$ ) of liquid and the surface tension ( $s$ ) of the liquid as :  $\nu = r^a \rho^b s^c$ . The value of a, b, c respectively are
- (A)  $\left(\frac{3}{2}, \frac{1}{2}, -\frac{1}{2}\right)$  (B)  $\left(-\frac{3}{2}, -\frac{1}{2}, \frac{1}{2}\right)$   
 (C)  $\left(-\frac{3}{2}, \frac{1}{2}, \frac{1}{2}\right)$  (D)  $\left(\frac{3}{2}, -\frac{1}{2}, \frac{1}{2}\right)$

- Q15.** Given below are two statements :
- Statement I :** Acceleration due to earth's gravity decreases as you go 'up' or 'down' from earth's surface.
- Statement II :** Acceleration due to earth's gravity is same at a height 'h' and depth 'd' from earth's surface, if  $h = d$ .

In the light of above statements, choose the most appropriate answer from the options given below

- (A) Statement I is incorrect but statement II is correct  
 (B) Both Statement I and Statement II are incorrect  
 (C) Statement I is correct but statement II is incorrect  
 (D) Both Statement I and II are correct
- Q16.** The electric field and magnetic field components of an electromagnetic wave going through vacuum is described by
- $$E_x = E_0 \sin(kz - \omega t)$$
- $$B_y = B_0 \sin(kz - \omega t)$$
- Then the correct relation  $E_0$  and  $B_0$  is given by
- (A)  $E_0 B_0 = \omega k$  (B)  $\omega E_0 = k B_0$   
 (C)  $E_0 = k B_0$  (D)  $k E_0 = \omega B_0$

- Q17.** A photon is emitted in transition from  $n = 4$  to  $n = 1$  level in hydrogen atom. The corresponding wavelength for this transition is (given,  $h = 4 \times 10^{-15} \text{ eVs}$ ) :
- (A) 94.1 nm (B) 974 nm  
 (C) 99.3 nm (D) 941 nm

- Q18.** Match List I with List II

**List - I**

- A. AM Broadcast  
 B. FM Broadcast  
 C. Television  
 D. Satellite Communication

**List - II**

- I. 88 – 108 MHz  
 II. 540 – 1600 kHz  
 III. 3.7 – 4.2 GHz  
 IV. 54 MHz – 890 MHz

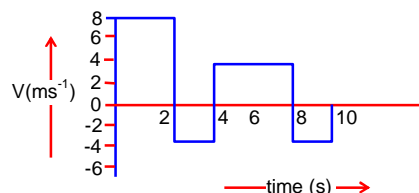
Choose the correct answer from the options given below :

- (A) A-IV, B-III, C-I, D-II (B) A-II, B-III, C-I, D-IV  
 (C) A-II, B-I, C-IV, D-III (D) A-I, B-III, C-II, D-IV
- Q19.** A long solenoid is formed by winding 70 turns  $\text{cm}^{-1}$ . If 2.0A current flows, then magnetic field produced inside the solenoid is \_\_\_\_\_ ( $\mu_0 = 4\pi \times 10^{-7} \text{ TmA}^{-1}$ )
- (A)  $176 \times 10^{-4} \text{ T}$  (B)  $88 \times 10^{-4} \text{ T}$   
 (C)  $352 \times 10^{-4} \text{ T}$  (D)  $1232 \times 10^{-4} \text{ T}$

- Q20.** The velocity time graph of body moving in a straight line is shown in figure.

The ratio of displacement to distance travelled by the body in time 0 to 10s is :

- (A) 1 : 1  
 (B) 1 : 4  
 (C) 1 : 3  
 (D) 1 : 2



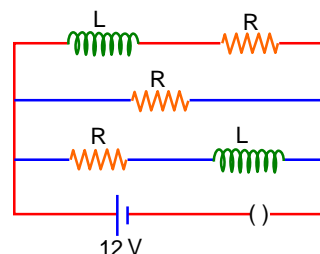
## SECTION - B

(Numerical Answer Type)

This section contains **10** Numerical based questions. The answer to each question is rounded off to the nearest integer value.

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- Q1.** Three identical resistors with resistance  $R = 12\Omega$  and two identical inductors with self inductance  $L = 5\text{ mH}$  are connected to an ideal battery with emf of  $12\text{ V}$  shown in figure. The current through the battery long after the switch has been closed will be \_\_\_\_\_ A.



- Q2.** A parallel plate capacitor with air between the plate has a capacitance of  $15\text{ pF}$ . The separation between the plate become twice and the space between them is filled with a medium of dielectric constant  $3.5$ . Then the capacitance becomes  $\frac{x}{4}\text{ pF}$ . The value of  $x$  is \_\_\_\_\_.
- Q3.** A Spherical ball of radius  $1\text{ mm}$  and density  $10.5\text{ g/cc}$  is dropped in glycerine of coefficient of viscosity  $9.8\text{ poise}$  and density  $1.5\text{ g/cc}$ . Viscous force on the ball when it attains constant velocity is  $3696 \times 10^{-x}\text{ N}$ . The value of  $x$  is (Given,  $g = 9.8\text{ m/s}^2$  and  $\pi = \frac{22}{7}$ )
- Q4.** A uniform solid cylinder with radius  $R$  and length  $L$  has moment inertia  $I_1$ , about the axis of the cylinder. A concentric solid cylinder of radius  $R' = \frac{R}{2}$  and length  $L' = \frac{L}{2}$  is carved out of the original cylinder. If  $I_2$  is the moment of inertia of the carved out portion of the cylinder then  $\frac{I_1}{I_2} =$  \_\_\_\_\_  
(Both  $I_1$  and  $I_2$  are about the axis of the cylinder)
- Q5.** A convex lens of refractive index  $1.5$  and focal length  $18\text{ cm}$  in air is immersed in water. The change of focal length of the lens will be \_\_\_\_\_ cm.  
(Given refractive index of water =  $\frac{4}{3}$ )
- Q6.** A body of mass  $1\text{ kg}$  begins to move under the action of a time dependent force  $\vec{F} = (t\hat{i} + 3t^2\hat{j})\text{ N}$ , where  $\hat{i}$  and  $\hat{j}$  are the unit vectors along  $x$  and  $y$  axis. The power developed by above force, at the time  $t = 2\text{ s}$ , will be \_\_\_\_\_ W.
- Q7.** If a copper wire is stretched to increase its length by  $20\%$ . The percentage increase in resistance of the wire is \_\_\_\_\_ %.
- Q8.** A single turn current loop in the shape of a right angle triangle with sides  $5\text{ cm}$ ,  $12\text{ cm}$ ,  $13\text{ cm}$  is carrying a current of  $2\text{ A}$ . The loop is in a uniform magnetic field of magnitude  $0.75\text{ T}$  whose direction is parallel to the current in the  $13\text{ cm}$  side of the loop. The magnitude of the magnetic force on the  $5\text{ cm}$  side will be  $\frac{x}{130}\text{ N}$ . The value of  $x$  is \_\_\_\_\_.
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- Q9.** The energy released per fission of nucleus of  $^{240}\text{X}$  is 200 MeV. The energy released if all the atoms in 120g of pure  $^{240}\text{X}$  undergo fission is \_\_\_\_\_  $\times 10^{25}$  MeV.
- Q10.** A mass  $m$  attached to free end of a spring executes SHM with a period of 1s. If the mass is increased by 3kg the period of oscillation increases by one second, the value of mass  $m$  is \_\_\_\_\_ kg.



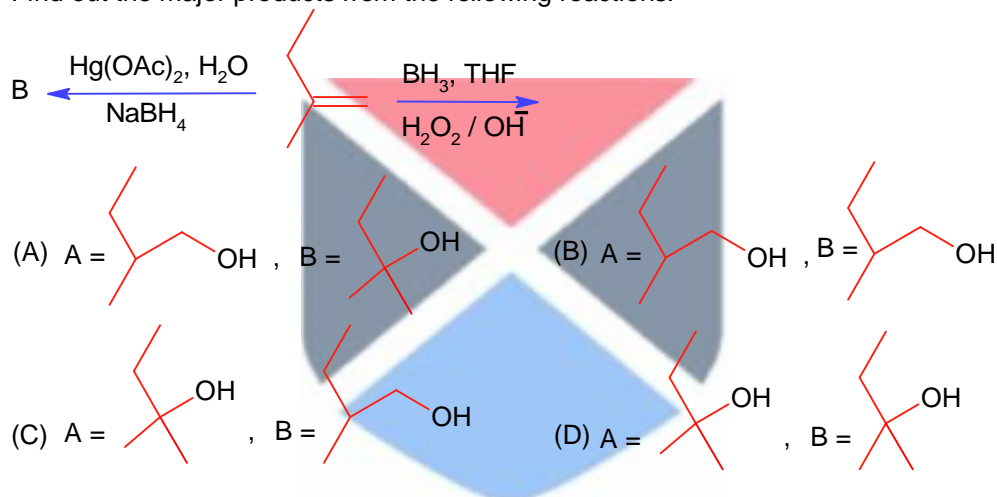
# PART - B (CHEMISTRY)

## SECTION - A

(One Options Correct Type)

This section contains **20 multiple choice questions**. Each question has **four choices** (A), (B), (C) and (D), out of which **ONLY ONE** option is correct.

- Q1.** The number of s-electrons present in an ion with 55 protons in its unipositive state is  
(A) 8 (B) 9  
(C) 12 (D) 10
- Q2.**  $K_2Cr_2O_7$  paper acidified with dilute  $H_2SO_4$  turns green when exposed to  
(A) Hydrogen sulphide (B) Sulphur trioxide  
(C) Carbon dioxide (D) Sulphur dioxide
- Q3.** Find out the major products from the following reactions.



- Q4.** Identify the correct statements about alkali metals.  
A. The order of standard reduction potential ( $M^+|M$ ) for alkali metal ions is  $Na > Rb > Li$ .  
B. CsI is highly soluble in water.  
C. Lithium carbonate is highly stable to heat.  
D. Potassium dissolved in concentrated liquid ammonia is blue in colour and paramagnetic.  
E. All the alkali metal hydrides are ionic solids.  
Choose the correct answer from the options given below:  
(A) C and E only (B) A, B and E only  
(C) A and E only (D) A, B, D only
- Q5.** What is the number of unpaired electron(s) in the highest occupied molecular orbital of the following species:  $N_2$ ;  $N_2^+$ ;  $O_2$ ;  $O_2^+$ ?  
(A) 0,1,2,1 (B) 2,1,2,1  
(C) 2,1,0,1 (D) 0,1,0,1
- Q6.** Which one amongst the following are good oxidizing agents?  
A.  $Sm^{2+}$   
B.  $Ce^{2+}$   
C.  $Ce^{4+}$   
D.  $Tb^{4+}$



Choose the most appropriate answer from the options given below:

- (A) C only (B) D only  
(C) C & D only (D) A & B only

**Q7.** Which of the following cannot be explained by crystal field theory?

- (A) The order of spectrochemical series  
(B) Colour of metal complexes  
(C) Stability of metal complexes  
(D) Magnetic properties of transition metal complexes

**Q8.** Given below are two statements:

**Statement I:** Pure Aniline and other arylamines are usually colourless.

**Statement II:** Arylamines get coloured on storage due to atmospheric reduction

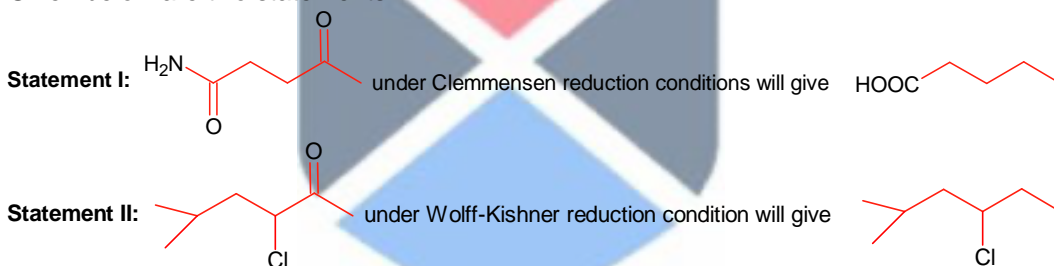
In the light of the above statements, choose the most appropriate answer from the options given below:

- (A) Both Statement I and Statement II are correct  
(B) Statement I is correct but Statement II is incorrect  
(C) Statement I is incorrect but Statement II is correct  
(D) Both statement I and Statement II are incorrect

**Q9.** The metal which is extracted by oxidation and subsequent reduction from its ore is:

- (A) Cu (B) Fe  
(C) Al (D) Ag

**Q10.** Given below are two statements:



In the light of the above statements, choose the correct answer from the options given below:

- (A) Both Statement I and Statement II are false  
(B) Statement I is false but Statement II is true  
(C) Statement I is true but Statement II is false  
(D) Both Statement I and Statement II are true

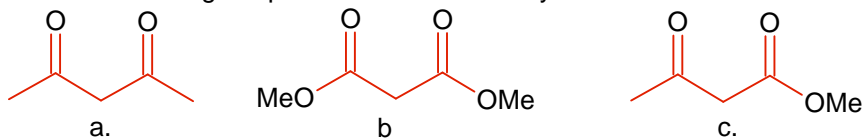
**Q11.** Correct statement is:

- (A) An average human being consumes 100 times more air than food  
(B) An average human being consumes more food than air  
(C) An average human being consumes equal amount of food and air  
(D) An average human being consumes nearly 15 times more air than food

**Q12.** In which of the following reactions the hydrogen peroxide acts as a reducing agent?

- (A)  $\text{Mn}^{2+} + \text{H}_2\text{O}_2 \rightarrow \text{Mn}^{4+} + 2\text{OH}^-$   
(B)  $\text{PbS} + 4\text{H}_2\text{O}_2 \rightarrow \text{PbSO}_4 + 4\text{H}_2\text{O}$   
(C)  $2\text{Fe}^{2+} + \text{H}_2\text{O}_2 \rightarrow 2\text{Fe}^{3+} + 2\text{OH}^-$   
(D)  $\text{HOCl} + \text{H}_2\text{O}_2 \rightarrow \text{H}_3\text{O}^+ + \text{Cl}^- + \text{O}_2$
-

Q13. Which will undergo deprotonation most readily in basic medium?



- (A) b only  
(C) Both a and c
- (B) a only  
(D) c only

Q14. Given below are two statements, one is labelled as **Assertion A** and the other is labelled as **Reason R**.

**Assertion A:** Benzene is more stable than hypothetical cyclohexatriene

**Reason R:** The delocalized  $\pi$  electron cloud is attracted more strongly by nuclei of carbon atoms.

In the light of the above statements, choose the correct answer from the options given below:

- (A) A is true but R is false  
(B) Both A and R are correct but R is NOT the correct explanation of A  
(C) Both A and R are correct and R is the correct explanation of A  
(D) A is false but R is true

Q15. A student has studied the decomposition of a gas  $AB_3$  at  $25^\circ\text{C}$ . He obtained the following data.

P(mm Hg)	50	100	200	400
Relative $t_{1/2}$ (s)	4	2	1	0.5

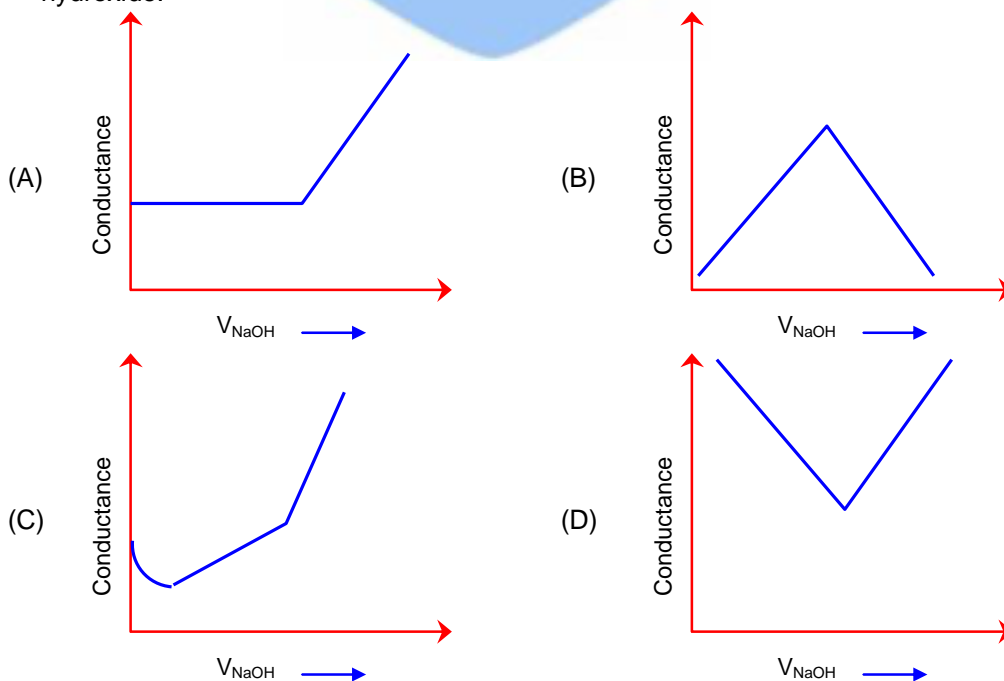
The order of the reaction is

- (A) 0.5  
(C) 1
- (B) 0 (zero)  
(D) 2

Q16. The hybridization and magnetic behaviour of cobalt ion in  $[\text{Co}(\text{NH}_3)_6]^{3+}$  complex, respectively is

- (A)  $d^2sp^3$  and diamagnetic  
(C)  $sp^3d^2$  and diamagnetic
- (B)  $sp^3d^2$  and paramagnetic  
(D)  $d^2sp^3$  and paramagnetic

Q17. Choose the correct representation of conductometric titration of benzoic acid vs sodium hydroxide.



**Q18.** Given below are two statements, one is labelled as **Assertion A** and the other is labelled as **Reason R**.

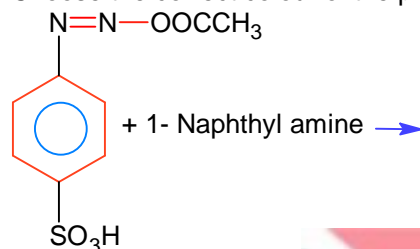
**Assertion A:** Beryllium has less negative value of reduction potential compared to the other alkaline earth metals.

**Reason R:** Beryllium has large hydration energy due to small size of  $\text{Be}^{2+}$  but relatively large value of atomization enthalpy

In the light of the above statements, choose the most appropriate answer from the options given below

- (A) Both A and R are correct and R is the correct explanation of A
- (B) Both A and R are correct but R is NOT the correct explanation of A
- (C) A is true but R is not correct
- (D) A is not correct but R is correct

**Q19.** Choose the correct colour of the product for the following reaction.



- (A) Blue
- (B) White
- (C) Yellow
- (D) Red

**Q20.** Match List I with List II

List-I (Type)		List (Name)	
A.	Antifertility drug	I.	Norethindrone
B.	Tranquilizer	II.	Meprobomate
C.	Antihistamine	III.	Seldane
D.	Antibiotic	IV.	Ampicillin

Choose the correct answer from the options given below:

- (A) A- IV, B-III, C-II, D- I
- (B) A-I, B-II, C-III, D-IV
- (C) A-I, B-III, C-II, D-IV
- (D) A-II, B-I, C-III, D-IV

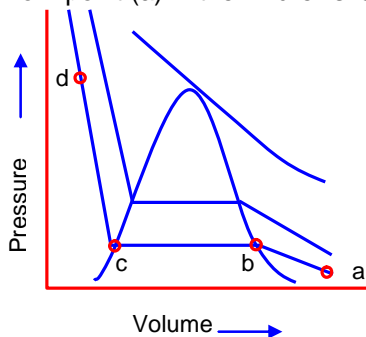
## SECTION - B

(Numerical Answer Type)

This section contains **10** Numerical based questions. The answer to each question is rounded off to the nearest integer value.

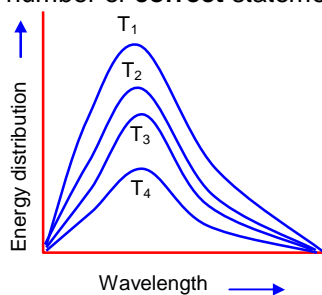
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- Q1.** The number of statement/s, which are **correct** with respect to the compression of carbon dioxide from point (a) in the Andrews isotherm from the following is \_\_\_\_\_.

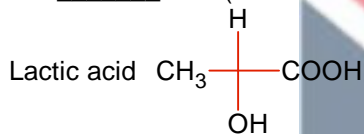


- A. Carbon dioxide remains as a gas upto point (b)  
B. Liquid carbon dioxide appears at point (c)  
C. Liquid and gaseous carbon dioxide coexist between points (b) and (c)  
D. As the volume decreases from (b) to (c), the amount of liquid decreases
- Q2.** Maximum number of isomeric monochloro derivatives which can be obtained from 2,2,5,5-tetramethylhexane by chlorination is \_\_\_\_\_
- Q3.** The number of units which are used to express concentration of solution from the following is \_\_\_\_\_.  
Mass percent, Mole, Mole fraction, Molarity, ppm, Molality
- Q4.** The number of statement/s which are the characteristics of physisorption is \_\_\_\_\_.  
A. It is highly specific in nature  
B. Enthalpy of adsorption is high  
C. It decreases with increase in temperature  
D. It results into unimolecular layer  
E. No activation energy is needed
- Q5.** Sum of  $\pi$ -bonds present in peroxodisulphuric acid and pyrosulphuric acid is \_\_\_\_\_.
- Q6.** The total pressure observed by mixing two liquids A and B is 350 mm Hg when their mole fraction are 0.7 and 0.3 respectively.  
The total pressure becomes 410 mm Hg if the mole fractions are changed to 0.2 and 0.8 respectively for A and B. The vapour pressure of pure A is \_\_\_\_\_ mm Hg. (Nearest integer).  
Consider the liquids and solutions behave ideally.
-

- Q7.** Following figure shows spectrum of an ideal black body at four different temperatures. The number of **correct** statement/s from the following is\_\_\_\_\_.

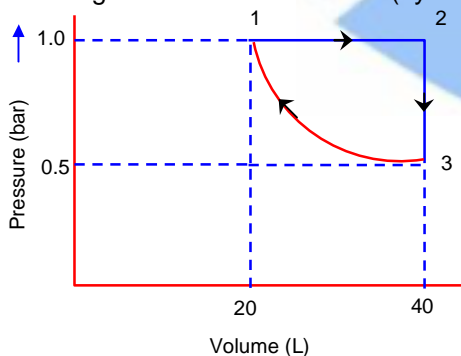


- A.  $T_4 > T_3 > T_2 > T_1$   
 B. The black body consists of particles performing simple harmonic motion.  
 C. The peak of the spectrum shifts to shorter wavelength as temperature increases.  
 D.  $\frac{T_1}{v_1} = \frac{T_2}{v_2} = \frac{T_3}{v_3} \neq \text{constant}$   
 E. The given spectrum could be explained using quantisation of energy
- Q8.** If the pK<sub>a</sub> of lactic acid is 5, then the pH of 0.005 M calcium lactate solution at 25°C is \_\_\_\_\_ $\times 10^{-1}$  (Nearest integer)



- Q9.** Total number of tripeptides possible by mixing of valine and proline is\_\_\_\_\_

- Q10.** One mole of an ideal monoatomic gas is subjected to changes as shown in the graph. The magnitude of the work done (by the system or on the system) is\_\_\_\_\_ J (nearest integer)



Given:  $\log 2 = 0.3$   
 $\ln 10 = 2.3$

# PART – C (MATHEMATICS)

## SECTION - A

(One Options Correct Type)

This section contains **20 multiple choice questions**. Each question has **four choices** (A), (B), (C) and (D), out of which **ONLY ONE** option is correct.

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**Q1.** Let  $y = y(x)$  be the solution of the differential equation  $(x^2 - 3y^2)dx + 3xy dy = 0$ ,  $y(1) = 1$ . Then  $6y^2(e)$  is equal to

- (A)  $\frac{3}{2}e^2$  (B)  $3e^2$   
(C)  $e^2$  (D)  $2e^2$

**Q2.** The number of real solutions of the equation  $3\left(x^2 + \frac{1}{x^2}\right) - 2\left(x + \frac{1}{x}\right) + 5 = 0$ , is

- (A) 4 (B) 0  
(C) 2 (D) 3

**Q3.** Let  $f(x)$  be a function such that  $f(x+y) = f(x) \cdot f(y)$  for all  $x, y \in \mathbb{N}$ . If  $f(1) = 3$  and

$\sum_{k=1}^n f(k) = 3279$ , then the value of  $n$  is

- (A) 8 (B) 7  
(C) 9 (D) 6

**Q4.** If the system of equations

$$\begin{aligned}x + 2y + 3z &= 3 \\4x + 3y - 4z &= 4 \\8x + 4y - \lambda z &= 9 + \mu\end{aligned}$$

has infinitely many solutions, then the ordered pair  $(\lambda, \mu)$  is equal to :

- (A)  $\left(-\frac{72}{5}, -\frac{21}{5}\right)$  (B)  $\left(\frac{72}{5}, -\frac{21}{5}\right)$   
(C)  $\left(\frac{72}{5}, \frac{21}{5}\right)$  (D)  $\left(-\frac{72}{5}, \frac{21}{5}\right)$

**Q5.** The number of integers, greater than 7000 that can be formed, using the digits 3,5,6,7,8 without repetition, is

- (A) 48 (B) 168  
(C) 120 (D) 220

**Q6.** The locus of the mid points of the chords of the circle  $C_1 : (x - 4)^2 + (y - 5)^2 = 4$  which subtend an angle  $\theta_1$  at the centre of the circle  $C_1$ , is a circle of radius  $r_1$ . If  $\theta_1 = \frac{\pi}{3}$ ,  $\theta_3 = \frac{2\pi}{3}$  and  $r_1^2 = r_2^2 + r_3^2$ , then  $\theta_2$  is equal to

- (A)  $\frac{3\pi}{4}$  (B)  $\frac{\pi}{6}$   
(C)  $\frac{\pi}{4}$  (D)  $\frac{\pi}{2}$
-

- Q7.** If  $f(x) = x^3 - x^2f'(1) + xf''(2) - f'''(3)$ ,  $x \in \mathbb{R}$ , then  
 (A)  $2f(0) - f(1) + f(3) = f(2)$  (B)  $f(3) - f(2) = f(1)$   
 (C)  $3f(1) + f(2) = f(3)$  (D)  $f(1) + f(2) + f(3) = f(0)$
- Q8.** If  $\binom{30}{C_1}^2 + 2\binom{30}{C_2}^2 + 3\binom{30}{C_3}^2 + \dots + 30\binom{30}{C_{30}}^2 = \frac{\alpha 60!}{(30!)^2}$  then  $\alpha$  is equal to :  
 (A) 15 (B) 10  
 (C) 60 (D) 30
- Q9.** Let the plane containing the line of intersection of the planes  $P1: x + (\lambda + 4)y + z = 1$  and  $P2: 2x + y + z = 2$  pass through the points  $(0,1,0)$  and  $(1,0,1)$ . Then the distance of the point  $(2\lambda, \lambda, -\lambda)$  from the plane  $P2$  is  
 (A)  $2\sqrt{6}$  (B)  $5\sqrt{6}$   
 (C)  $3\sqrt{6}$  (D)  $4\sqrt{6}$
- Q10.** Let the six numbers  $a_1, a_2, a_3, a_4, a_5, a_6$ , be in A.P. and  $a_1 + a_3 = 10$ . If the mean of these six numbers is  $\frac{19}{2}$  and their variance is  $\sigma^2$ , then  $8\sigma^2$  is equal to :  
 (A) 105 (B) 220  
 (C) 210 (D) 200
- Q11.** Let  $p$  and  $q$  be two statements. Then  $\sim(p \wedge (p \Rightarrow \sim q))$  is equivalent to  
 (A)  $p \vee (p \wedge q)$  (B)  $p \vee (p \wedge (\sim q))$   
 (C)  $(\sim p) \vee q$  (D)  $p \vee ((\sim p) \wedge q)$
- Q12.** The set of all values of  $a$  for which  $\lim_{x \rightarrow a} ([x - 5] - [2x + 2]) = 0$ , where  $[\alpha]$  denotes the greatest integer less than or equal to  $\alpha$  is equal to  
 (A)  $(-7.5, -6.5]$  (B)  $[-7.5, -6.5]$   
 (C)  $(-7.5, -6.5)$  (D)  $[-7.5, -6.5)$
- Q13.** If  $f(x) = \frac{2^{2x}}{2^{2x} + 2}$ ,  $x \in \mathbb{R}$ , then  $f\left(\frac{1}{2023}\right) + f\left(\frac{2}{2023}\right) + \dots + f\left(\frac{2022}{2023}\right)$  is equal to  
 (A) 1010 (B) 1011  
 (C) 2011 (D) 2010
- Q14.** The equations of the sides  $AB$  and  $AC$  of a triangle  $ABC$  are  $(\lambda + 1)x + \lambda y = 4$  and  $\lambda x + (1 - \lambda)y + \lambda = 0$  respectively. Its vertex  $A$  is on the  $y$ -axis and its orthocentre is  $(1, 2)$ . The length of the tangent from the point  $C$  to the part of the parabola  $y^2 = 6x$  in the first quadrant is :  
 (A)  $2\sqrt{2}$  (B) 2  
 (C)  $\sqrt{6}$  (D) 4
-

**Q15.** The value of  $\left( \frac{1 + \sin \frac{2\pi}{9} + i \cos \frac{2\pi}{9}}{1 + \sin \frac{2\pi}{9} - i \cos \frac{2\pi}{9}} \right)^3$  is

(A)  $\frac{1}{2}(1 - i\sqrt{3})$

(B)  $-\frac{1}{2}(1 - i\sqrt{3})$

(C)  $\frac{1}{2}(\sqrt{3} + i)$

(D)  $-\frac{1}{2}(\sqrt{3} - i)$

**Q16.** Let  $\vec{\alpha} = 4\hat{i} + 3\hat{j} + 5\hat{k}$  and  $\vec{\beta} = \hat{i} + 2\hat{j} - 4\hat{k}$ . Let  $\vec{\beta}_1$  be parallel to  $\vec{\alpha}$  and  $\vec{\beta}_2$  be perpendicular to  $\vec{\alpha}$ . If  $\vec{\beta} = \vec{\beta}_1 + \vec{\beta}_2$ , then the value of  $5\vec{\beta}_2 \cdot (\hat{i} + \hat{j} + \hat{k})$  is

(A) 7

(B) 9

(C) 6

(D) 11

**Q17.**  $\int_{\frac{3\sqrt{2}}{4}}^{\frac{3\sqrt{3}}{4}} \frac{48}{\sqrt{9-4x^2}} dx$  is equal to

(A)  $\frac{\pi}{3}$

(B)  $2\pi$

(C)  $\frac{\pi}{2}$

(D)  $\frac{\pi}{6}$

**Q18.** Let A be a 3 x 3 matrix such that  $|\text{adj}(\text{adj}(\text{adj} A))| = 12^4$ . Then  $|A^{-1} \text{adj} A|$  is equal to

(A)  $2\sqrt{3}$

(B) 1

(C)  $\sqrt{6}$

(D) 12

**Q19.** If the foot of the perpendicular drawn from (1,9,7) to the line passing through the point (3,2,1) and parallel to the planes  $x + 2y + z = 0$  and  $3y - z = 3$  is  $(\alpha, \beta, \gamma)$ , then  $\alpha + \beta + \gamma$  is equal to

(A) 1

(B) 3

(C) 5

(D) -1

**Q20.** The number of square matrices of order 5 with entries from the set  $\{0,1\}$ , such that the sum of all the elements in each row is 1 and the sum of all the elements in each column is also 1, is

(A) 120

(B) 125

(C) 225

(D) 150



## SECTION - B

**(Numerical Answer Type)**

This section contains **10** Numerical based questions. The answer to each question is rounded off to the nearest integer value.

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- Q1.** Let  $S = \{\theta \in [0, 2\pi) : \tan(\pi \cos \theta) + \tan(\pi \sin \theta) = 0\}$ . Then  $\sum_{\theta \in S} \sin^2\left(\theta + \frac{\pi}{4}\right)$  is equal to.....
- Q2.** The minimum number of elements that must be added to the relation  $R = \{(a,b), (b,c), (b,d)\}$  on the set  $\{a,b,c,d\}$  so that it is an equivalence relation, is.....
- Q3.** The equations of the sides AB, BC and CA of a triangle ABC are :  $2x + y = 0, x + py = 21a, (a \neq 0)$  and  $x - y = 3$  respectively. Let  $P(2,a)$  be the centroid of  $\triangle ABC$ . Then  $(BC)^2$  is equal to
- Q4.** If  $\frac{1^3 + 2^3 + 3^3 + \dots \text{up to } n \text{ terms}}{1 \cdot 3 + 2 \cdot 5 + 3 \cdot 7 + \dots \text{up to } n \text{ terms}} = \frac{9}{5}$ , then the value of n is
- Q5.** Let  $f$  be a differentiable function defined on  $\left[0, \frac{\pi}{2}\right]$  such that  $f(x) > 0$  and  $f(x) + \int_0^x f(t) \sqrt{1 - (\log_e f(t))^2} dt = e, \forall x \in \left[0, \frac{\pi}{2}\right]$ . Then  $\left(6 \log_e f\left(\frac{\pi}{6}\right)\right)^2$  is equal to.....
- Q6.** If the shortest between the lines  $\frac{x + \sqrt{6}}{2} = \frac{y - \sqrt{6}}{3} = \frac{z - \sqrt{6}}{4}$  and  $\frac{x - \lambda}{3} = \frac{y - 2\sqrt{6}}{4} = \frac{z + 2\sqrt{6}}{5}$  is 6, then the square of sum of all possible values of  $\lambda$  is
- Q7.** If the area of the region bounded by the curves  $y^2 - 2y = -x, x + y = 0$  is A, then  $8A$  is equal to
- Q8.** Three urns A, B and C contain 4 red, 6 black; 5 red, 5 black; and  $\lambda$  red, 4 black balls respectively. One of the urns is selected at random and a ball is drawn. If the ball drawn is red and the probability that it is drawn from urn C is 0.4 then the square of the length of the side of the largest equilateral triangle, inscribed in the parabola  $y^2 = \lambda x$  with one vertex at the vertex of the parabola, is
- Q9.** Let the sum of the coefficients of the first three terms in the expansion of  $\left(x - \frac{3}{x^2}\right)^n, x \neq 0, n \in \mathbb{N}$ , be 376. Then the coefficient of  $x^4$  is.....
- Q10.** Let  $\vec{a} = \hat{i} + 2\hat{j} + \lambda\hat{k}, \vec{b} = 3\hat{i} - 5\hat{j} - \lambda\hat{k}, \vec{a} \cdot \vec{c} = 7, 2\vec{b} \cdot \vec{c} + 43 = 0, \vec{a} \times \vec{c} = \vec{b} \times \vec{c}$ . Then  $|\vec{a} \cdot \vec{b}|$  is equal to
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# Keys to JEE Main 2024 Mock Test 6

## PART - A (PHYSICS)

### SECTION - A

1.	B	2.	C	3.	A	4.	D
5.	D	6.	A	7.	B	8.	B
9.	A	10.	C	11.	D	12.	A
13.	D	14.	B	15.	C	16.	D
17.	A	18.	C	19.	A	20.	C

### SECTION - B

1.	3	2.	105	3.	7	4.	32
5.	54	6.	100	7.	44	8.	9
9.	6	10.	1				

## PART - B (CHEMISTRY)

### SECTION - A

1.	D	2.	D	3.	A	4.	C
5.	A	6.	C	7.	A	8.	B
9.	D	10.	C	11.	D	12.	D
13.	B	14.	C	15.	D	16.	A
17.	C	18.	A	19.	D	20.	B

### SECTION - B

1.	2	2.	3	3.	5	4.	2
5.	8	6.	314	7.	2	8.	85
9.	8	10.	620				

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# PART - C (MATHEMATICS)

## SECTION - A

- |     |   |     |   |     |   |     |   |
|-----|---|-----|---|-----|---|-----|---|
| 1.  | D | 2.  | B | 3.  | B | 4.  | B |
| 5.  | B | 6.  | D | 7.  | A | 8.  | A |
| 9.  | C | 10. | C | 11. | C | 12. | C |
| 13. | B | 14. | A | 15. | D | 16. | A |
| 17. | B | 18. | A | 19. | C | 20. | A |

## SECTION - B

- |    |     |     |     |    |    |    |     |
|----|-----|-----|-----|----|----|----|-----|
| 1. | 2   | 2.  | 13  | 3. | 29 | 4. | 5   |
| 5. | 27  | 6.  | 384 | 7. | 36 | 8. | 432 |
| 9. | 405 | 10. | 8   |    |    |    |     |

