Cambridge Classes
AIPMT IIT AIEEE

I–02

IIT Cracker Test Series 2007–08

Subject: P + C + M **IIT-JEE 2008** ***Date: 23–09-2007***

Time: 180 minutes ***MM: 243***

A. General:

1. This booklet is your Question Paper containing 66 questions printed 19 pages.
2. Blank papers, clipboards log tables, slide rules, calculators, cellular phones, pagers, and electronic gadgets in any form are not allowed to be carried inside the examination hall.
3. Objective Response Sheet (ORS), is provided separately.
4. On the Top of ORS please fill all the details.

B. Question paper format:

5. The question paper consists of 3 parts (Physics, Chemistry and Mathematics). Each Part has 4 sections.
6. **Section I** contains 9 multiple-choice questions. Each question has 4 choices (A), (B), (C), (D), out of which **only one is correct**.
7. **Section II** contains 4 questions. Each question contains STATEMENT-1 (Assertion) and STATEMENT -2 (Reason).
   Mark option (A) in the *ORS* if both the statements are **TRUE** and **STATEMENT-2 is** the correct explanation of **STATEMNT -1**.
   Mark option (B) in the *ORS* if both the statements are **TRUE** but **STATEMENT-2 is NOT** the correct explanation of STATEMNT -1.
   Mark option (C) in the *ORS* if STATEMENT-1 is **TRUE** and STATEMENT-2 is **FALSE**.
   Mark option (D) in the *ORS* if STATEMENT-1 is **FALSE** and STATEMENT-2 is **TRUE**
8. **Section III** contains 2 paragraphs. Based upon each paragraph, 3 multiple-choice questions have to be answered. Each question has 4 choices (A), (B), (C) and (D), out of which **only one is correct**.
9. **Section IV** contains 3 questions. Each question contains statements given in 2 columns. Statements in the first column have to be matched with statements in the second column. The answers to these questions have to be marked in the ORS as per the instruction given at the beginning of the section.

D. Marking Scheme:

10. For each question in **Section I**, you will be **awarded 3 marks** if you have marked only the correct answer and **zero mark** if no option is marked. In all other cases, **minus one (-1) mark** will be awarded.
11. For each question in **section II**, you will be **awarded 3 marks** if you have marked only the correct answer and **zero mark** if no option is marked. In all other cases, **minus one (-1) mark** will be awarded.
12. For each question in **Section III**, you will be **awarded 4 marks** if you have marked only the correct answer and **zero mark** if no option is marked. In all other cases, **minus one (-1) mark** will be awarded.
13. For each question in **Section IV**, you will be **awarded 6 marks** if you have marked only the correct answer. **No Negative mark will be awarded for an incorrect answer.**

Name:

Batch:

SECTION – I
Straight Objective Type

This section contains 9 multiple-choice questions numbered 1 to 9. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

1. The range of a projectile fired at an angle of 15° is 50m. If it is fired with the same speed at an angle of 45°, its range will de

   (A) 25m (B) 37m (C) 50m (D) 100m.

2. A 60 kg man pushes a 40 kg man by a force of 60 N. The 40 kg man has pushed the other man with a force

   (A) 40 N (B) 0 (C) 60 N (D) 20 N.

3. Three rigid rods are joined to form an equilateral triangle ABC of side 1*m*. Three particles carrying charges 20μC each are attached to the vertices of the triangle. The whole system is at rest in an inertial frame. The resultant force on the charged particle at A has the magnitude

   (A) zero (B) 3·6 N (C) $3{\cdot}6\sqrt{3}$ N (D) 7·2 N.

4. A scooter starting from rest moves with a constant acceleration for a time Δt_1, then with a constant velocity for the next Δt_2 and finally with a constant deceleration for the next Δt_3 to come to rest. A 500 N man sitting on the scooter behind the driver manages to stay at rest with respect to the scooter without touching any other part. The force exerted by the seat on the man is

   (A) 500 N throughout the journey

   (B) less than 500 N throughout the journey

   (C) more than 500 N throughout the journey

   (D) >500 N for time Δt_1 and Δt_3 and 500 N for Δt_2

5. Two equal masses are attached to the two ends of a spring constant *k* The masses are pulled out symmetrically to stretch the spring by a length *x* over its natural length. The work done by the spring on each mass is

   (A) $\frac{1}{2}\,kx^2$ (B) $-\frac{1}{2}\,kx^2$ (C) $\frac{1}{4}\,kx^2$ (D) $-\frac{1}{4}\,kx^2$

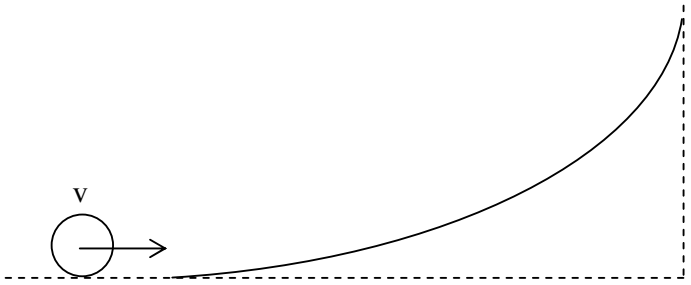
6. A shell is fired from a cannon with a velocity V at an angle θ with the horizontal direction. At the highest point in its path, it explodes into two pieces of equal masses. One of the pieces retraces its path to the cannon. The speed of the other piece immediately after the explosion is

   (A) 3V cos i (B) 2V cos θ (C) $\frac{3}{2}$ V cos θ (D) V cos θ.

7. The moment of inertia of a uniform semicircular wire of mass M and radius *r* about a line perpendicular to the plane of the wire through the centre is

(A) Mr^2 (B) $\frac{1}{2}Mr^2$ (C) $\frac{1}{4}Mr^2$ (D) $\frac{2}{5}Mr^2$

8. A small object of uniform density rolls up a curved surface with an initial velocity *v*. It reaches up to a maximum height of $\frac{5v^2}{6g}$ with respect to the initial position. The object is



(A) ring (B) solid sphere (C) hollow sphere (D) disc

9. A student performs an experiment to determine the Young's modulus of a wire, exactly 2m long, by Searle's method. In a particular reading, the student measures the extension in the length of the wire to be 0.8 mm with an uncertainty of ± 0.02 mm at a load of exactly 1.0 kg. The student also measures the diameter of the wire to be 0.4 mm with an uncertainty of ± 0.01 mm. Take g = 9.8 m/s^2 (exact). The Young's modulus obtained from the reading is

(A) $(2.0 \pm 0.3) \times 10^{11}$ N/m^2 (B) $(2.0 \pm 0.2) \times 10^{11}$ N/m^2

(C) $(2.0 \pm 0.1) \times 10^{11}$ N/m^2 (D) $(2.0 \pm 0.05) \times 10^{11}$ N/m^2

SECTION – II
Assertion – Reason Type

This section contains 4 questions numbered 10 to 13. Each question contains STATEMENT–1. (Assertion) and STATEMENT–2 (Reason). Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

10. **STATEMENT – 1**
Particles A and B each of mass m are circulating about fixed point O with angular velocities ω_A and ω_B respectively at radius of rotations r_A and r_B respectively. As viewed from particle A particle B shall have centrifugal force of magnitude $mw_A^2 r_A$.

because

STATEMENT – 2
Centrifugal force is a pseudo force whose magnitude is equal to mass of the particle X acceleration of rotating frame.

(A) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is True; Statement-2 is **NOT** a correct Explanation for Statement-1

(C) Statement -1 True, Statement -2 is False

(D) Statement -1 is False, Statement -2 is True

11. **STATEMENT – 1**
If there is net external torque on a body about its center of mass, then the angular velocity of the body about the center of mass remains constant.

because

STATEMENT – 2
The angular momentum of an isolated system remains constant.

(A) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is True; Statement-2 is **NOT** a correct Explanation for Statement-1

(C) Statement -1 True, Statement -2 is False

(D) Statement -1 is False, Statement -2 is True

12. **STATEMENT – 1**
A block of mass m starts moving on a horizontal rough surface with a velocity *v*. It stops due to friction between the block and the surface after moving through a certain distance. The surface is now tilted to an angle of 30° with the horizontal and the same block is made to go up on the surface with the same initial velocity *v*. The decrease in the mechanical energy in the second situation is greater than that in the first situation.

because

STATEMENT – 2
The coefficient of friction between the block and the surface does not change with the increase in the angle of inclination.

(A) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is True; Statement-2 is **NOT** a correct Explanation for Statement-1

(C) Statement -1 True, Statement -2 is False

(D) Statement -1 is False, Statement -2 is True

13. **STATEMENT – 1**
In an inelastic collision between two bodies, the relative speed of the bodies after collision is not equal to the relative speed before the collision

because

STATEMENT – 2
In an inelastic collision, the linear momentum of the system is not conserved.

(A) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is True; Statement-2 is **NOT** a correct Explanation for Statement-1

(C) Statement -1 True, Statement -2 is False

(D) Statement -1 is False, Statement -2 is True

SECTION – III
Linked Comprehension Type

This section contains 2 paragraphs $\mathbf{P_{14-16}}$ and $\mathbf{P_{17-19}}$. Based upon each paragraph, 3 multiple-choice questions have to be answered. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

$\mathbf{P_{14-16}}$: Paragraph for Question Nos. 14 to 16

Two discs A and B are mounted coaxially on a vertical axle. The discs have moments of inertia I and 2I respectively about the common axis. Disc A is imparted an initial angular velocity 2ω using the entire potential energy of a spring compressed by a distance x_1. Disc B is imparted an angular velocity ω by a spring having the same spring constant and compressed by a distance x_2. Both the discs rotate in the clockwise direction.

14. The ratio x_2/x_1 is:
(A) 2 (B) $\frac{1}{2}$ (C) $\sqrt{2}$ (D) $\frac{1}{\sqrt{2}}$

15. When disc B is brought in contact with disc A, they acquire a common angular velocity in time t. The average frictional torque on two-disc system during this period is:
(A) $\frac{2I\omega}{3t}$ (B) $\frac{9I\omega}{2t}$ (C) zreo (D) $\frac{3I\omega}{2t}$

16. The loss of kinetic energy of Disc A during the above process is:
(A) $\frac{10\,I\omega^2}{9}$ (B) $\frac{I\omega^2}{3}$ (C) $\frac{I\omega^2}{4}$ (D) $\frac{I\omega^2}{6}$

$\mathbf{P_{17-19}}$: Paragraph for Question Nos. 17 to 19

Consider a one–dimensional collision that involves a body of mass m_1 originally moving in the positive x direction with speed v_0 colliding with a second body of mass m_2 originally at rest. The collision could be completely inelastic, with the two bodies sticking together, completely elastic, or some–where in between. After the collision, m_1 moves with velocity v_1 while m_2 moves with velocity v_2.

17. If $m_1 > m_2$, then
(A) $-v_0 < v_1 < 0$ (B) $0 < v_1 < v_0$ (C) $0 < v_1 < 2v_0$ (D) $v_0 < v_1 < 2v_0$

18. and
(A) $-v_0 < v_2 < 0$ (B) $0 < v_2 < v_0$ (C) $v_0/2 < v_2 < 2v_0$ (D) $v_0 < v_2 < 2v_0$

19. If $m_1 < m_2$ then
(A) $-v_0 < v_1 < 0$ (B) $-v_0 < v_1 < v_0/2$ (C) $0 < v_1 < v_0/2$ (D) $0 < v_1 < v_0$

SECTION – IV
Matrix–Match Type

This section contains 3 questions. Each question contains statements given in two columns, which have to be matched. Statements (A, B, C, D) in Column–I have to be matched with statements (p, q, r, s) in Column–II. The answers to these questions have to be appropriately marked in the ***ORS***.

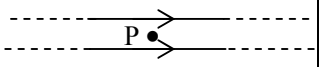
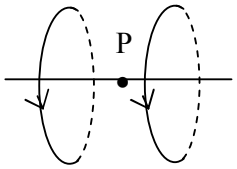
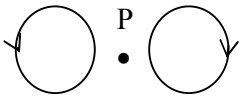
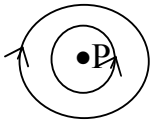
20. Column I describes some situations in which a small object moves. Column II describes some characteristics of these motions. Match the situations in Column I with the characteristics in Column II and indicate your answer by darkening appropriate in the 4 × 4 matrix given in the ORS.

Column – I	**Column – II**
(A) The object moves on the x-axis under a conservative force in such a way that its "speed" and "position" satisfy $v = c_1 \sqrt{c_2 - x^2}$ where c_1 and c_2 are positive constants.	(p) The object executes a simple harmonic motion.
(B) The object moves on the x-axis in such a way that its velocity and its displacement from the origin satisfy $v = -kx$, where k is a positive constant.	(q) The object does not change its direction.
(C) The object is attached to one end of a mass-less spring of a given spring constant. The other end of the spring is attached to the ceiling of an elevator. Initially everything is at rest. The elevator starts going upwards with a constant acceleration a. The motion of the object is observed from the elevator during the period it maintains this acceleration.	(r) The kinetic energy of the object keeps on decreasing.
(D) The object is projected from the earth's surface vertically upwards with a speed $2\sqrt{GM_e/R_e}$, where, M_e is the mass of the earth and R_e is the radius of the earth. Neglect forces objects other than the earth.	(s) The object can change its direction only once.

21. Some physical quantities are given in Column I and some possible SI units in which these quantities may be expressed are given in Column II. Match the physical quantities in Column I with the units in Column II and indicate your answer by darkening appropriate bubbles in the 4 × 4 matrix given in the ORS.

Column – I	**Column – II**
(A) $GM_e M_s$ G – universal gravitational constant, M_e – mass of the earth, M_s – mass of the Sun	(p) (volt) (coulomb) (metre)
(B) $\frac{3RT}{M}$ R – universal gas constant, T – absolute temperature, M – molar mass	(q) (kilogram) (metre)^3 (second)$^{-2}$
(C) $\frac{F^2}{q^2B^2}$ F – force, q - charge, B – magnetic field	(r) (metre)^2 (second)$^{-2}$
(D) $\frac{GM_e}{R_e}$ G – universal gravitational constant, M_e – mass of the earth, R_e – radius of the earth	(s) (farad) (volt)^2 (kg)$^{-1}$

22. Two wires each carrying a steady current I are shown in four configurations in Column I. Some of the resulting effects are described in Column II. Match the statements in Column I with the statements in Column II and indicate your answer given in the ORS.

Column I		**Column II**
(A) Point P is situated midway between the wires.		(p) The magnetic fields (B) at P due to the currents in the wires are in the same direction.
(B) Point P is situated at the mid-point of the line joining the centers of the circular wires, which have same radii		(q) The magnetic fields (B) at P due to the currents in the wires are in opposite directions.
(C) Point P is situated at the mid-point of the line joining the centers of the circular wires, which have same radii		(r) There is no magnetic field at P.
(D) Point P is situated at the common center of the wires		(s) The wires repel each other.

SECTION – I
Straight Objective Type

This section contains 9 multiple-choice questions numbered 23 to 31. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

23. Liquid benzene burns in O_2 according to the equation;

$$2C_6H_6 + 15O_2 \rightarrow 12CO_2 + 6H_2O$$

If the density of liquid benzene at 20ºC is 0.88 g cm^{-3}, how many litre of O_2 gas at STP are needed to complete the combustion of 39 cm^3 of liquid benzene?

(A) 11.2 L (B) 74 L (C) 22.4 L (D) 84 L

24. What is the molarity of each ion in a solution prepared by dissolving 0.550 g of Na_2SO_4, 1.188 g of Na_3PO_4 of 0.223 g of Li_2SO_4 in water and diluting to a volume of 100.00 mL respectively?

(A) $Na^+ = 0.295$ M; $Li^+ = 0.0406$ M, $SO_4^{2-} = 0.0590$ M; $PO_4^{3-} = 0.0725$ M

(B) $Na^+ = 0.0406$ M; $Li^+ = 0.590$ M, $SO_4^{2-} = 0.295$ M; $PO_4^{3-} = 0.0725$ M

(C) $Na^+ = 0.0725$ M; $Li^+ = 0.295$ M, $SO_4^{2-} = 0.0406$ M; $PO_4^{3-} = 0.0590$ M

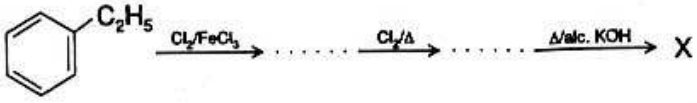
(D) $Na^+ = 0.0590$ M; $Li^+ = 0.0725$ M, $SO_4^{2-} = 0.295$ M; $PO_4^{3-} = 0.0406$ M

25. Assume that you dissolve 10.0 g of a mixture of NaOH and $Ba(OH)_2$ in 250.0 mL of water and titrate with 1.50 M HCl acid. The titration is complete after 108.9 mL of the acid has been added. What is the mass of NaOH and $Ba(OH)_2$ in the mixture?

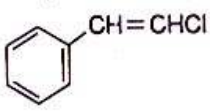
(A) $Ba(OH)_2 = 3.5$ g; NaOH = 6.5 g (B) $Ba(OH)_2 = 5$ g; NaOH = 5 g
(C) $Ba(OH)_2 = 7.5$ g; NaOH = 2.5 g (D) $Ba(OH)_2 = 6.5$ g; NaOH = 3.5 g

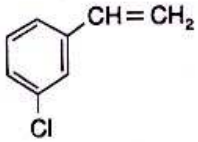
26. 1.6 g of bleaching powder is dissolved in water and made up to 200 mL. 20 mL of this solution after treatment with excess of KI and dil. acetic acid needed 18.8 mL of 0.08 N $Na_2S_2O_3$ solution. The % of available chlorine in the sample of bleaching powder is:

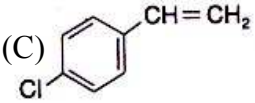
(A) 11.11% (B) 33.37% (C) 44.44% (D) 66.66%

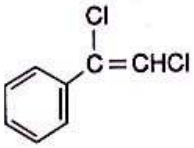
27. 

The Compound X is:

(A) 

(B) 

(C) 

(D) 

28. The Product of each of the following reactions:

(a) $CH_3 - CH = \underset{CH_3}{\overset{|}{C}}H + :NH_3 \rightarrow$

(b) $CH_3 - CH = C(H)(C(=O)-CH_3) + :NH_3 \rightarrow$

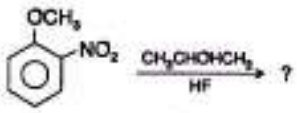
(A) (a) No reaction (b) $H_3C - \underset{NH_2}{\overset{H}{\overset{|}{C}}} - \underset{H}{\overset{H}{\overset{|}{C}}} - COCH_3$

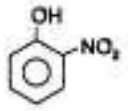
(B) (a) $CH_3 - \underset{NH_2}{\overset{|}{C}}H - CH_2 - CH_3$ (b) $CH_3 - \underset{NH_2}{\overset{|}{C}}H - CH_2 - COCH_3$

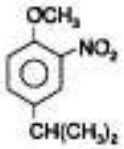
(C) (a) $CH_3 - \underset{NH_2}{\overset{|}{C}}H - CH_2 - CH_3$ (b) No reaction

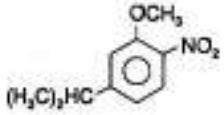
(D) (a) No reaction (b) $CH_3 - CH_2 - \underset{NH_2}{\overset{|}{C}}H - COCH_3$

29. Among the various alkynes, the one that cannot be prepared by alkylation of acetylene is:
(A) $CH_3 . CH_2 . CH_2 . C \equiv CH$ (B) $CH_3 . CH_2 . C \equiv C . CH_3$
(C) $(CH_3)_3 C\ C \equiv CH$ (D) None

30. 

(A) 

(B) 

(C) 

(D) No reaction due to deactivating effect of $-NO_2$ group

31. 3-phenyl-3-pentanol is prepared by using Grignard synthesis, in different ways as given below:
(1) 3-pentanone + phenyl magnesium bromide
(2) ethyl phenyl ketone + ethyl magnesium bromide
(3) methyl benzoate + ethyl magnesium bromide
The possible method (s) is/are:
(A) 1 only (B) 1 & 2 only (C) 2 & 3 only (D) 1, 2 & 3

SECTION – II
Assertion – Reason Type

This section contains 4 questions numbered 32 to 35. Each question contains STATEMENT–1. (Assertion) and STATEMENT–2 (Reason). Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

32. **STATEMENT – 1**
Addition of HBr to $CH \equiv C - CH_2 - CH = CH_2$ gives
$HC \equiv C - CH_2 - CHBr - CH_3$ and not $H_2C = CBr - CH_2 - CH = CH_2$

because

STATEMENT – 2

A triple bond is less reactive than a double bond.
(A) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is True; Statement-2 is **NOT** a correct Explanation for Statement-1

(C) Statement -1 True, Statement -2 is False

(D) Statement -1 is False, Statement -2 is True

33. **STATEMENT – 1**
Aryl halides undergo nucleophilic substitution with ease.

Because

STATEMENT – 2
Carbon–halogen bond in aryl halides has partial double bond character.

(A) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is True; Statement-2 is **NOT** a correct Explanation for Statement-1

(C) Statement -1 True, Statement -2 is False

(D) Statement -1 is False, Statement -2 is True

34. **STATEMENT – 1**
Hydroxyketones are not directly used in Grignard reaction.

Because

STATEMENT – 2
Grignard reagents react with hydroxyl group.

(A) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is True; Statement-2 is **NOT** a correct Explanation for Statement-1

(C) Statement -1 True, Statement -2 is False

(D) Statement -1 is False, Statement -2 is True

35. STATEMENT – 1
Nitration of benzoic acid gives *m*–nitrobenzoic acid.

Because

STATEMENT – 2
Carboxyl group increases the electron–density at meta–position.

(A) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is True; Statement-2 is **NOT** a correct Explanation for Statement-1

(C) Statement -1 True, Statement -2 is False

(D) Statement -1 is False, Statement -2 is True

Section – III
Linked Comprehension Type

This section contains 2 paragraphs C_{36-38} and C_{39-41}. Based upon each paragraph, 3 multiple choice question have be answered. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

C_{36-38} : Paragraph for Question Nos. 36-38.

Now for something greener than compressed natural gas (CNG). India may use its vast organic wastes to produce compressed biogas (CBG), which will supplement CNG. While technology to compress biogas has already been devised, it will not be too long before our cars will be running on CBG.

As of now, biogas is primarily used in rural households for cooking purpose. Assume that Biogas (crude) has 80% of methane content and 20% of carbon dioxide (by moles). This biogas can be purified to match CNG standard by use of advanced technologies. The purity of CBG is given in terms of its methane content by moles. CNG, for all practical purposes, is pure methane.

The CBG produced can be used in the same cylinders that store CNG and will match the efficiency of CNG.

Being a product of cow dung, sewage, sludge, non edible oils and organic fractions of municipal solid waste and crop residues not suitable for fodder, biogas when used as a fuel, recycles carbon dioxide, not emitting a net amount. This makes it a cleaner fuel than CNG.

36. The pressure exerted by equal weights of LPG, CNG & CBG (crude form) under identical conditions would follow the order: (Assume that LPG is n-butane)
(A) LPG > CNG > CBG (B) CBG > CNG > LPG
(C) CNG > CBG > LPG (D) LPG > CBG > CNG

37. A cylinder when filled with CNG at 20 atm pressure and 27°C weighs 10.0 kg. When the cylinder is evacuated, it weighs 8.4 kg. The evacuated cylinder is then filled with 80 % pure CBG at 27°C. If the pressure recorded is the same, the weight of the cylinder becomes:
(A) 10.56 kg. (B) 12.16 kg. (C) 9.68 kg. (D) None of these

38. In the previous problem, what would be the final pressure inside the cylinder when the weight of the cylinder, during the course of use at 27°C, is reduced to 9.48 kg:
(A) 14.8 atm (B) 12.6 atm (C) 10 atm (D) None of these

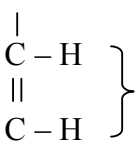
C_{39-41} : Paragraph for Question Nos. 39-41.

Bond dissociation energies of the indicated C – H bonds are given below. These values clearly indicate that extraction of allylic H is easiest. Hence, reactivity of different type of H is in the order:

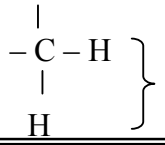
allylic > 3º > 2º > 1º > methyl > vinylic

Also ease of formation and stability of free radicals is in order:

allyl > 3º > 2º > 1º > methyl > vinyl

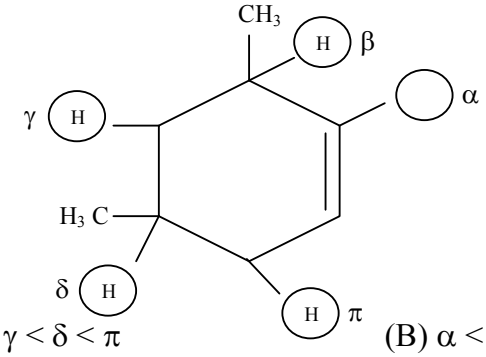


vinylic hydrogen : hard to abstract



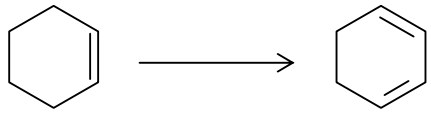
Allylic hydrogen : easy to abstract

39. Increasing order of reactivity of different type of hydrogen in the following compound is:



(A) $\alpha < \beta < \gamma < \delta < \pi$ (B) $\alpha < \gamma < \delta < \pi < \beta$

(C) $\alpha < \gamma < \delta < \beta < \pi$ (D) $\gamma < \alpha < \delta < \pi < \beta$

40. 

(A) (B)

To convert A into B, we can use

I $A \xrightarrow{Br_2} \xrightarrow{\text{alcoholic KOH}} B$

II $A \xrightarrow{KOH} \xrightarrow{\text{Conc. } H_2SO_4} B$

III $A \xrightarrow{NBS} \xrightarrow{\text{alcoholic KOH}} B$

Which method is supposed to be correct?

(A) I (B) II (C) III (D) none of these

41. Identify the products in the following reaction:

$$CH_3CH_2CH = CH_2 + NBS \rightarrow$$

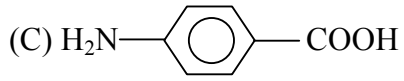
(A) $CH_3\underset{\underset{Br}{|}}{CH} - CH = CH_2$ (B) $CH_3 CH = CHCH_2Br$

(C) $CH_2 = CH - CH_2CH_2Br$ (D) (A) and (B) both

SECTION – IV
Matrix–Match Type

This section contains 3 questions. Each question contains statements given in two columns which have to be matched. Statements (A, B, C, D) in Column–I have to be matched with statements (p, q, r, s) in Column–II. The answers to these questions have to be marked in the ***ORS***.

42. Observe the following lists:

Column – I	Column – II
(A) Hydrogen bonding	(P) Ethyl acetoacetate
(B) β-amino acids	(Q) Proteins
(C) 	(R) Zwitterion
(D) Aniline	(S) Diazotisation

43. 2.0 L water gas was mixed with 8.0 L of air (H_2 : O_2 = 4:1by volume) and ignited. The resulting gaseous mixture was cooled to 25° C and successively brought in contact with aqueous KOH and alkaline pyrogallol. If all volumes were measured at 25° C and 1 atm pressure, match the following:

Column – I	Column – II
(A) Total volume of mixture that results	(P) 6.4 L
(B) Contraction in volumes by aqueous KOH	(Q) 0.6 L
(C) Contraction in volumes by alkaline pyrogallol	(R) 1.0 L
(D) Volume of residual gas	(S) 8.0 L

44. Match the following:

Column – I	Column – II
(A) Molar volume of a gas	(P) Temperature dependent
(B) Translational K.E. of gas molecules	(Q) Temperature independent
(C) Vapour density of a gas	(R) Pressure dependent
(D) Density of a gas	(S) Pressure independent

Section – I
Straight Objective Type

This section contains 9 multiple-choice questions numbered 45 to 53. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

45. $\sec^2\theta = \frac{4xy}{(x+y)^2}$ is true if and only if

(A) $x + y \neq 0$ (B) $x = y, x \neq 0$ (C) $x = y$ (D) $x \neq 0, y \neq 0$

46. The number of values of x in the interval $[0, 5\pi]$ satisfying the equation $3\sin^2 x - 7\sin x + 2 = 0$ is

(A) 0 (B) 5 (C) 6 (D) 10

47. If $\sin\left(\sin^{-1}\frac{1}{5} + \cos^{-1}x\right) = 1$, then x is equal to

(A) 1 (B) 0 (C) $\frac{4}{5}$ (D) $\frac{1}{5}$

48. CF is the internal bisector of angle C of Δ ABC then CF is equal to

(A) $\frac{2ab}{a+b}\sin\frac{C}{2}$ (B) $\frac{a+b}{2b}\cos\frac{C}{2}$ (C) $\frac{b\sin A}{\sin\left(B+\frac{C}{2}\right)}$ (D) none of these

49. The third term of a G.P. is 4. The product of first five terms is

(A) 4^3 (B) 4^5 (C) 4^4 (D) None of these.

50. If α and β ($\alpha < \beta$), are the roots of the equation $x^2 + bx + c = 0$, where $c < 0 < b$, than

(A) $0 < \alpha < \beta$ (B) $\alpha < 0 < \beta < |\alpha|$ (C) $\alpha < \beta < 0$ (D) $\alpha < 0 < |\alpha| < \beta$

51. If ${}^{n-1}C_r = (k^2-3)\,{}^nC_{r+1}$, then $k \in$

(A) $(-\sqrt{3}, \sqrt{3})$ (B) $(\sqrt{3}, 2]$ (C) $[0, \sqrt{3}]$ (D) $(\sqrt{3}, 2)$

52. For $2 \le r \le n$, $\binom{n}{r} + 2\binom{n}{r-1} + \binom{n}{r-2} =$

(A) $\binom{n+1}{r-1}$ (B) $2\binom{n+1}{r+1}$ (C) $2\binom{n+2}{r}$ (D) $\binom{n+2}{r}$

53. If $2\log(x+1) - \log(x^2-1) = \log 2$, then x equals

(a) 1 (b) 0 (c) 2 (d) 3

SECTION – II
Assertion – Reason Type

This section contains 4 questions numbered 54 to 57. Each question contains STATEMENT–1. (Assertion) and STATEMENT–2 (Reason). Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

54. In the triangle ABC, Let D be a point on BC such that $2\angle BAD = \angle BAC$.
SRATEMENT – 1
The ratio BD : DC equals AB : AC

because

STATEMENT – 2
In any triangle, bisector of an angle divides the triangle into two similar triangles.

(A) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is True; Statement-2 is **NOT** a correct Explanation for Statement-1

(C) Statement -1 True, Statement -2 is False

(D) Statement -1 is False, Statement -2 is True

55. Consider cubic function $y = x^3 + 5x^2 + 7x$ and
quadratic function $y = x^2 + 5x + 7$; $x, y \in R$.
STATEMENT – 1
These two functions have only one point of intersection.

because

STATEMENT – 2
A cubic and quadratic functions shall always have only one point of intersection.

(A) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is True; Statement-2 is **NOT** a correct Explanation for Statement-1

(C) Statement -1 True, Statement -2 is False

(D) Statement -1 is False, Statement -2 is True

56. In a triangle ABC if $\sum\left(\frac{1}{\sin A \sin B}\right) = \frac{9}{\Sigma(\sin A \sin B)}$.

STATEMENT -1
The triangle ABC is equilateral.

because

STATEMENT – 2
For positive numbers, AM = GM = HM $\Leftrightarrow$ numbers are all equal to each other.

(A) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is True; Statement-2 is **NOT** a correct Explanation for Statement-1

(C) Statement -1 True, Statement -2 is False

(D) Statement -1 is False, Statement -2 is True

57. Consider the Curve $Y = \log_{\sqrt{(2x-3)^2}} 5$

STATEMENT –1
There is no real value of y for x = 0.

because

STATEMENT –2
for x = –1 y = 1

(A) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is True; Statement-2 is **NOT** a correct Explanation for Statement-1

(C) Statement -1 True, Statement -2 is False

(D) Statement -1 is False, Statement -2 is True

SECTION – III
Linked Comprehension Type

This section contains 2 paragraphs $\mathbf{M_{58-60}}$ and $\mathbf{M_{61-63}}$. Based upon each paragraph, 3 multiple choice question have be answered. Each question has 4 choices (A), (B), (C) and (D), out of which ONLY ONE is correct.

$\mathbf{M_{58-60}}$: Paragraph for question Nos. 58 t0 60

Let A_1, G_1, H_1 denote the arithmetic, the geometric and harmonic means, respectively, of two distinct positive numbers. For $n \geq 2$, let A_{n-1} and H_{n-1} have arithmetic, geometric and harmonic means as A_n, G_n, H_n respectively.

58. Which one of the following statements is correct?
(A) $G_1 > G_2 > G_3 > \ldots\ldots$ (B) $G_1 < G_2 < G_3 < \ldots\ldots$
(C) $G_1 = G_2 = G_3 = \ldots\ldots$ (D) $G_1 < G_3 < G_5 < \ldots\ldots$ and $G_2 > G_4 > G_6 > \ldots\ldots$

59. Which one of the following statements is correct?
(A) $A_1 > A_2 > A_3 > \ldots\ldots$ (B) $A_1 < A_2 < A_3 < \ldots\ldots$
(C) $A_1 > A_3 > A_5 > \ldots\ldots$and $A_2 < A_4 < A_6 < \ldots\ldots$
(D) $A_1 < A_3 < A_5 < \ldots\ldots$ and $A_2 > A_4 > A_6 > \ldots\ldots$

60. Which one of the following statements is correct?
(A) $H_1 > H_2 > H_3 > \ldots\ldots$ (B) $H_1 < H_2 < H_3 < \ldots\ldots$
(C) $H_1 > H_3 > H_5 > \ldots\ldots$and $H_2 < H_4 < H_6 < \ldots\ldots$
(D) $H_1 < H_3 < H_5 < \ldots\ldots$ and $H_2 > H_4 > H_6 > \ldots\ldots$

$\mathbf{M_{61-63}}$: Paragraph for question Nos. 61 t0 63

Let V_r denote the sum of the first *r* terms of an arithmetic progression (A.P.) whose first term is r and the common difference is (2r -1). Let

$$T_r = V_{r+1} - V_r - 2 \text{ and } Q_r = T_{r+1} - T_r \text{ for } r = 1, 2, \ldots..$$

61. The sum $V_1 + V_2 + \ldots + V_n$ is.
(A) $\frac{1}{12} n(n+1)(3n^2 - n + 1)$ (B) $\frac{1}{12} n(n+1)(3n^2 + n + 2)$
(C) $\frac{1}{2} n(2n^2 - n + 1)$ (D) $\frac{1}{3}(2n^3 - 2n + 3)$

62. T_r is always.
(A) an odd number (B) an even number
(C) a prime number (D) a composite number

63. Which one of the following is a correct statement?
(A) $Q_1, Q_2, Q_3, \ldots$.are in A.P. with common difference 5
(B) $Q_1, Q_2, Q_3, \ldots$ are in A.P. with common difference 6
(C) $Q_1, Q_2, Q_3, \ldots$ are in A.P. with common difference 11
(D) $Q_1 = Q_2 = Q_3 = \ldots$.

SECTION – IV
Matrix–Match Type

This section contains 3 questions. Each question contains statements given in two columns which have to be matched. Statements (A, B, C, D) in Column–I have to be matched with statements (p, q, r, s) in Column–II. The answers to these questions have to be appropriately marked in the ***ORS***.

64. Let $f(x) = \dfrac{x^2 - 6x + 5}{x^2 - 5x + 6}$.

Math the expressions/statements in Column I with expressions/statements in Column II and indicate your answer given in the ORS.

Column I	Column II
(A) If $-1 < x < 1$, then f(x) satisfies	(p) $0 < f(x) < 1$
(B) If $1 < x < 2$, then f(x) satisfies	(q) $f(x) < 0$
(C) If $3 < x < 5$, then f(x) satisfies	(r) $f(x) > 0$
(D) If $x > 5$, then f(x) satisfies	(s) $f(x) < 1$

65. Consider the following linear equations

$ax + by + cz = 0, \quad bx + cy + az = 0, \quad cx + ay + bz = 0$

Match the conditions/expressions in Column I with statements in Column II and indicate your answer given in the ORS.

Column I	Column II
(A) $a + b + c \neq 0$ and $a^2 + b^2 + c^2 = ab + bc + ca$	(p) the equations represent plants meeting only at a single point
(B) $a + b + c = 0$ and $a^2 + b^2 + c^2 \neq ab + bc + ca$	(q) the equations represent the line $x = y = z$
(C) $a + b + c \neq 0$ and $a^2 + b^2 + c^2 \neq ab + bc + ca$	(r) the equations represent identical planes
(D) $a + b + c = 0$ and $a^2 + b^2 + c^2 = ab + bc + ca$	(s) the equations represent the whole of the three dimensional space

66. Let (x, y) be such that

$$\text{Sin}^{-1}(a\,x) + \cos^{-1}(y) + \cos^{-1}(bx\,y) = \frac{\pi}{2}$$

Match the statements in Column I with statements in Column II and indicate your answer given in the ORS.

Column I	Column I
(A) If $a = 1$ and $b = 0$, then (x,y)	(p) lies on the circle $x^2 + y^2 = 1$
(B) If $a = 1$ and $b = 1$, then (x, y)	(q) lies on $(x^2 - 1)(y^2 - 1) = 0$
(C) If $a = 1$ and $b = 2$, then (x, y)	(r) lies on $y = x$
(D) If $a = 2$ and $b = 2$, then (x ,y)	(s) lies on $(4x^2 - 1)(y^2 - 1) = 0$

IIT Cracker Test Series 2007–08

Subject: P + C + M **IIT-JEE 08** ***Date: 23–09-2007***

Name _____ ***Batch*** _____

OBJECTIVE RESPONSE SHEET

PHYSICS

Q.	1.	2.	3.	4.	5.
Ans.					
Q.	6.	7.	8.	9.	
Ans.					

Q.	10.	11.	12.	13.	
Ans.					

Q.	14.	15.	16.	17.	18.	19.
Ans.						

Q.	20.	21.	22.
Ans.	**(A) →** **(B) →** **(C) →** **(D) →**	**(A) →** **(B) →** **(C) →** **(D) →**	**(A) →** **(B) →** **(C) →** **(D) →**

CHEMISTRY

Q.	23.	24.	25.	26.	27.
Ans.					
Q.	28.	29.	30.	31.	
Ans.					

Q.	32.	33.	34.	35.	
Ans.					

Q.	36.	37.	38.	39.	40.	41.
Ans.						

Q.	42.	43.	44.
Ans.	**(A) →** **(B) →** **(C) →** **(D) →**	**(A) →** **(B) →** **(C) →** **(D) →**	**(A) →** **(B) →** **(C) →** **(D) →**

MATHS

Q.	45.	46.	47.	48.	49.
Ans.					
Q.	50.	51.	52.	53.	
Ans.					

Q.	54.	55.	56.	57.	
Ans.					

Q.	58.	59.	60.	61.	62.	63.
Ans.						

Q.	64.	65.	66.
Ans.	**(A) →** **(B) →** **(C) →** **(D) →**	**(A) →** **(B) →** **(C) →** **(D) →**	**(A) →** **(B) →** **(C) →** **(D) →**

IIT Cracker Test Series 2007–08

Subject: P + C + M **IIT-JEE 08** ***Date: 23–09-2007***

OBJECTIVE RESPONSE SHEET

PHYSICS

Q.	1.	2.	3.	4.	5.
Ans.	**D**	**C**	**A**	**D**	**D**
Q.	6.	7.	8.	9.	
Ans.	**A**	**A**	**C**	**C**	

Q.	10.	11.	12.	13.	
Ans.	**A**	**D**	**D**	**C**	

Q.	14.	15.	16.	17.	18.	19.
Ans.	**D**	**C**	**A**	**B**	**C**	**B**

Q.	20.	21.	22.
Ans.	**(A) → p** **(B) → q, r** **(C) → p** **(D) → q, r**	**(A) → p, q** **(B) → r, s** **(C) → r, s** **(D) → r, s**	**(A) → q, r** **(B) → p** **(C) → q, r** **(D) → q**

CHEMISTRY

Q.	23.	24.	25.	26.	27.
Ans.	**B**	**A**	**D**	**B**	**C**
Q.	28.	29.	30.	31.	
Ans.	**A**	**B**	**B**	**D**	

Q.	32.	33.	34.	35.	
Ans.	**A**	**D**	**A**	**C**	

Q.	36.	37.	38.	39.	40.	41.
Ans.	**C**	**A**	**C**	**B**	**C**	**D**

Q.	42.	43.	44.
Ans.	**(A) → p, q** **(B) → r** **(C) → r, s** **(D) → s**	**(A) → s** **(B) → r** **(C) → q** **(D) → p**	**(A) → p, r** **(B) → p, s** **(C) → q, s** **(D) → p, r**

MATHS

Q.	45.	46.	47.	48.	49.
Ans.	**B**	**C**	**D**	**C**	**B**
Q.	50.	51.	52.	53.	
Ans.	**B**	**B**	**D**	**D**	

Q.	54.	55.	56.	57.	
Ans.	**C**	**D**	**A**	**D**	

Q.	58.	59.	60.	61.	62.	63.
Ans.	**C**	**A**	**B**	**B**	**D**	**B**

Q.	64.	65.	66.
Ans.	**(A) → p, r, s** **(B) → q, s** **(C) → q, s** **(D) → p, r, s**	**(A) → r** **(B) → q** **(C) → p** **(D) → s**	**(A) → p** **(B) → q** **(C) → p** **(D) → s**