

Mock Advanced Test-3 Paper-2

TIME : 3 hrs	M.M. : 180
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Read the following Instructions very carefully before you proceed.

A. General

1. This booklet is your Question Paper. Do not break the seals of this booklet before being instructed to do so by the invigilators.
2. Blank papers, clipboards, log tables, slide rules, calculators, cameras, cellular phones, pagers, and electronic gadgets are NOT allowed inside the examination hall.
3. **Using a black ball point pen, darken the bubbles on the upper original sheet.** Apply sufficient pressure so that the impression is created on the bottom sheet.
4. DO NOT TAMPER WITH/MUTILATE THE OMR OR THE BOOKLET.
5. Read carefully the Instructions printed at the beginning of each section.

B. Filling the Right Part of the OMR

6. For answering a question, an ANSWER SHEET (OMR SHEET) is provided separately. Please fill your **Test Code**, **Roll No.** and **Group** properly in the space given in the ANSWER SHEET.

C. Question Paper Format

The question paper consists of **3 SUBJECTS** (Physics, Chemistry and Mathematics). Each SUBJECT consists of one section only. Each section contains three types (1, 2 & 3).

12. **TYPE-1** contains 10 Multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE CHOICE** is correct.
13. **TYPE-2** contains 3 Paragraphs each describing theory, experiment, data etc. There are 6 multiple choice questions relating to three paragraphs with 2 questions on each paragraph. Each question of a particular paragraph has four choices (A), (B), (C) and (D) out of which **ONLY ONE CHOICE is correct**.
14. **TYPE-3** contains **4 Match the following Objective type Questions**. Each question contains statements given in 2 columns. Statements in the column I have to be matched with statements in column II and then option with the appropriate code is to be marked in the answer sheet. **The options for the correct match are provided as (A), (B), (C) and (D) out of which ONLY ONE CHOICE is Correct.**

D. Marking Scheme

15. For each question of TYPE-1, TYPE-2 and TYPE-3, you will be awarded **3 marks** if you darken the bubble corresponding to the correct answer **ONLY** and zero (0) marks if no bubbles are darkened. **In all other cases, minus one (-1) mark will be awarded in these sections.**

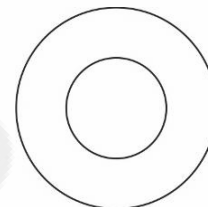
TYPE-1

SINGLE CORRECT ANSWER

This section contains 10 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONLY ONE Choice is Correct:

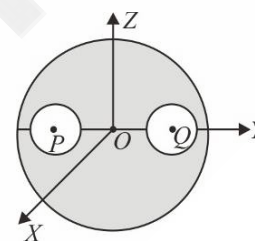
1. A soap bubble of radius R is surrounded by another soap bubble of radius $2R$, as shown in figure. Take surface tension = S . Then, the pressure inside the smaller soap bubble, in excess of the atmospheric pressure, will be :

(A) $4S/R$ (B) $3S/R$
(C) $6S/R$ (D) None of these



2. A solid sphere of uniform density and mass M has radius 4 m. Its centre is at the origin of the coordinate system. Two spheres of radii 1 m are taken out so that their centres are at $P(0, -2, 0)$ and $Q(0, 2, 0)$, respectively. This leaves two spherical cavities. What is the gravitational field at the origin of the coordinate axes?

(A) $\frac{31GM}{1024}$ (B) $\frac{Gm}{1024}$
(C) $31G/M$ (D) Zero

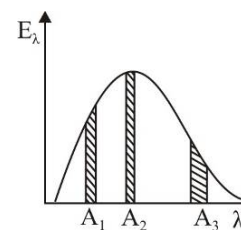


3. Five point charges, $+q$ each, are placed at the five vertices of a regular hexagon. The distance of centre of the hexagon from any of the vertices is a . The electric field at the centre of the hexagon is :

(A) $\frac{q}{4\pi\epsilon_0 a^2}$ (B) $\frac{q}{8\pi\epsilon_0 a^2}$ (C) $\frac{q}{16\pi\epsilon_0 a^2}$ (D) Zero

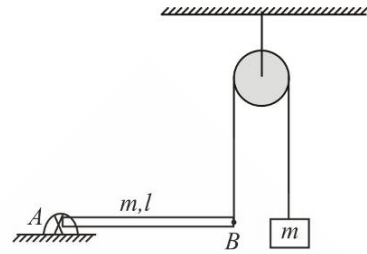
4. Three separate segments of equal area A_1 , A_2 and A_3 are shown in the energy distribution curve of a blackbody radiation. If n_1 , n_2 and n_3 are number of photons emitted per unit time corresponding to each area segment respectively then:

(A) $n_2 > n_1 > n_3$ (B) $n_3 > n_1 > n_2$
(C) $n_1 = n_2 = n_3$ (D) $n_3 > n_2 > n_1$



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5. Uniform rod AB is hinged at the end A in a horizontal position as shown in the figure. The other end is connected to a block through a massless string as shown. The pulley is smooth and massless. Masses of the block and the rod are same and are equal to ' m '. Then acceleration of the block just after release from this position is:

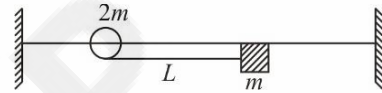


- (A) $6g/13$ (B) $g/4$
 (C) $3g/8$ (D) None of these

6. The energy that should be added to an electron, to reduce its de-Broglie wavelength from 2×10^{-9} m to 0.5×10^{-9} m will be:

- (A) 1.1 MeV (B) 40.56 MeV (C) 0.56 KeV (D) 5.6 eV

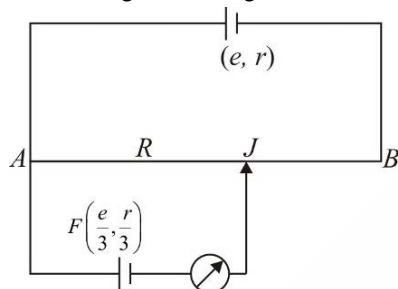
7. A bead can slide on a smooth straight wire and a particle of mass m is attached to the bead by a light string of length L . The particle is held in contact with the wire with the string taut and is then let fall. The bead has mass $2m$. When the string makes an angle θ with the wire the bead will have slipped a distance equal to :



- (A) $L(1 - \cos \theta)$ (B) $\frac{L}{2}(1 - \cos \theta)$ (C) $\frac{L}{3}(1 - \cos \theta)$ (D) $\frac{L}{6}(1 - \cos \theta)$

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8. A potentiometer arrangement is shown in the figure. Driving cell has e.m.f. e and internal resistance r .



Resistance of potentiometer wire AB is R , F is the cell of e.m.f. $e/3$ and internal resistance $r/3$. Balance point (J) can be obtained for all finite values of :

- (A) $R > r/2$ (B) $R < r/2$ (C) $R > r/3$ (D) $R < r/3$
9. When the temperature of a black body increases, it is observed that the wavelength corresponding to maximum energy changes from $0.26 \mu\text{m}$ to $0.13 \mu\text{m}$. The ratio of the emissive powers of the body at the respective temperatures is :
- (A) $\frac{16}{1}$ (B) $\frac{4}{1}$ (C) $\frac{1}{4}$ (D) $\frac{1}{16}$
10. In displacement method distance of object from a convex lens of focal length 20 cm in one position is 60 cm . Then
- (A) In the other position distance of object from the convex lens will be 30 cm
 (B) Distance between object and screen is 90 cm
 (C) Both (A) and (B) are correct
 (D) Both (A) and (B) are wrong

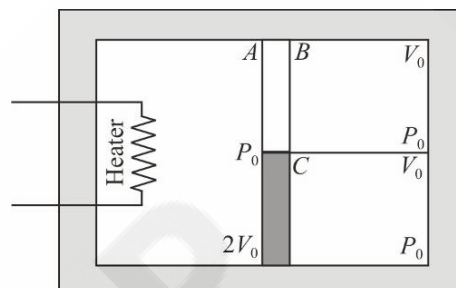
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TYPE-2
LINK COMPREHENSION TYPE

This section contains 6 multiple choice questions relating to three paragraphs with two questions on each paragraph. Each question has four choices A, B, C and D out of which ONLY ONE is correct.

Paragraph for Questions 11 - 12

A container of volume $4V_0$ made of a perfectly non-conducting material is divided into two equal parts by a fixed rigid wall whose lower half is non-conducting and upper half is purely conducting. The right side of the wall is divided into equal parts (initially) by means of a massless non-conducting piston free to move as shown. Section A contains 2 mol of a gas while the section B and C contain 1 mol each of the same gas ($\gamma = 1.5$) at pressure P_0 . The heater in left part is switched on till the final pressure in section C becomes $125/27 P_0$. Calculate :



11. Final temperature in part C.

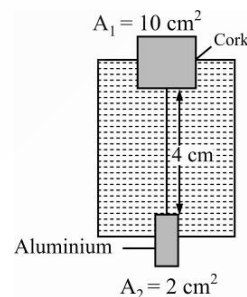
- (A) $\frac{P_0 V_0}{R}$ (B) $\frac{5P_0 V_0}{3R}$ (C) $\frac{P_0 V_0}{3R}$ (D) $\frac{5P_0 V_0}{R}$

12. The heat supplied by the heater :

- (A) $\frac{368}{9} P_0 V_0$ (B) $\frac{113}{5} P_0 V_0$ (C) $\frac{316}{9} P_0 V_0$ (D) $\frac{405}{8} P_0 V_0$

Paragraph for Questions 13 - 14

A cylindrical object of cork of mass 15 g and cross-sectional area $A_1 = 10 \text{ cm}^2$ floats in a pan of water as shown in the figure. An aluminium cylinder of mass 25 g and cross-sectional area $A_2 = 2 \text{ cm}^2$ is attached with a string, 4 cm below the cork and slides through a watertight frictionless hole in the bottom of the pan. Take density of the cork, $\rho = 0.2 \text{ g/cm}^3$, $\rho_{\text{aluminium}} = 2.7 \text{ g/cm}^3$, $g = 10 \text{ m/s}^2$. Based on the above information, answer the following question. [Density of water = 1 g/cm^3]



13. The length of the cork cylinder inside the water in equilibrium is :

- (A) 6 cm (B) 4 cm (C) 8 cm (D) 3 cm

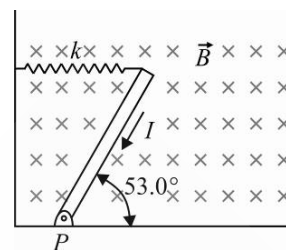
14. The tension in the string joining the cork and aluminium cylinder is :

- (A) 2 N (B) 1 N (C) 0.45 N (D) 0.6 N

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Paragraph for Questions 15 - 16

A thin, uniform rod with negligible mass and length 0.200 m is attached to the floor by a frictionless hinge at point P (as shown in the figure). A horizontal spring with force constant $k = 4.80\text{ Nm}^{-1}$ connects the other end of the rod to a vertical wall. The rod is in a uniform magnetic field $B = 0.340\text{ T}$ directed into the plane of the figure. There is current $I = 6.50\text{ A}$ in the rod, in the direction shown.



15. Calculate the torque due to the magnetic force on the rod, for an axis at P .
- (A) 0.0442 Nm^{-1} , into the plane (B) 0.0442 Nm^{-1} , out of the plane
 (C) 0.022 Nm^{-1} , into the plane (D) 0.022 Nm^{-1} , out of the plane
16. When the rod is in equilibrium it makes an angle of 53.0° with the floor as shown in the figure, how much is the spring stretched or compressed?
- (A) 0.05765 m , stretched (B) 0.05765 m , compressed
 (C) 0.0242 m , stretched (D) 0.0242 m , compressed

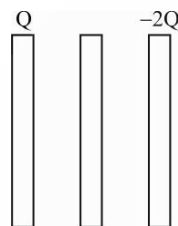
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TYPE-3

MATCH MATRIX TYPE

This section contains 4 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which **ONLY ONE Choice is Correct:**

17. Three identical metal plates with large surface areas are kept parallel to each other as shown in figure. The leftmost plate is given charge Q , the rightmost given charge $-2Q$ and the middle one remains neutral. Then :



	Column-1		Column-2
(P)	The charge appearing on outer surface of the rightmost plate	1.	$+Q/2$
(Q)	The charge appearing on outer surface of the leftmost plate	2.	$-Q/2$
(R)	The charge appearing on left surface of the middle plate	3.	$-3Q/2$
(S)	The charge appearing on right surface of the middle plate	4.	$3Q/2$

Codes :

	P	Q	R	S		P	Q	R	S
(A)	1	4	3	2	(B)	2	2	3	4
(C)	2	3	4	1	(D)	3	4	2	1

18. For a concave mirror of focal length 20 cm, match the following: (Column-1 gives object distance for a real object).

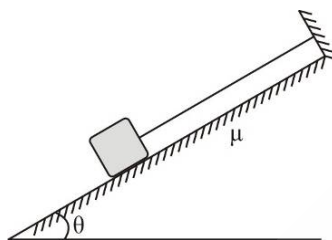
	Column-1		Column-2
(P)	10 cm	1.	Magnified, inverted and real
(Q)	30 cm	2.	Equal size, inverted and real
(R)	40 cm	3.	Smaller, inverted and real
(S)	50 cm	4.	Magnified, erect and virtual

Codes :

	P	Q	R	S		P	Q	R	S
(A)	1	4	2	3	(B)	2	3	1	4
(C)	3	4	1	2	(D)	4	1	2	3

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19. A block of mass m is put on a rough inclined plane of inclination θ , and is tied with a light thread shown. Inclination θ is increased gradually from $\theta = 0^\circ$ to $\theta = 90^\circ$. Match the column according to corresponding curve.



	Column-1		Column-2
(P)	Tension in the thread versus θ	1.	
(Q)	Normal reaction between the block and the incline versus θ	2.	
(R)	Friction force between the block and the incline versus θ	3.	
(S)	Net interaction force between the block and the incline versus θ	4.	

Codes :

	P	Q	R	S		P	Q	R	S
(A)	2	4	3	1	(B)	2	4	1	4
(C)	3	4	1	2	(D)	1	3	4	2

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20. In the table shown, Column II shows the possible outcomes to the water level of a swimming pool when a person standing on a boat in it does any one of the actions shown in Column I match the possible outcomes.

	Column-1		Column-2
(P)	He throws a 20 kg iron anchor from the boat into the water, which then settles at the bottom ($\rho_{iron} > \rho_{water}$).	1.	The water level of swimming pool becomes lower
(Q)	He throws a 20 kg log of wood from the boat. The log floats on water ($\rho_{wood} < \rho_{water}$).	2.	The water level of swimming pool becomes higher
(R)	He empties 20 kg of water from the boat into the pool.	3.	The water level of swimming pool stays the same
(S)	He drinks some water from the pool.	4.	The water level of swimming pool cannot be predicted from the information given

Codes :

	P	Q	R	S		P	Q	R	S
(A)	4	3	2	1	(B)	1	3	3	3
(C)	2	4	3	1	(D)	1	2	4	3

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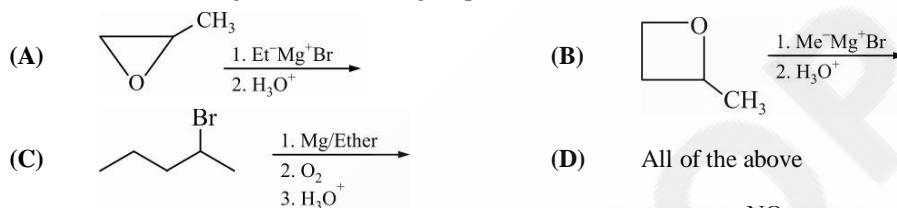
TYPE-1

SINGLE CORRECT ANSWER

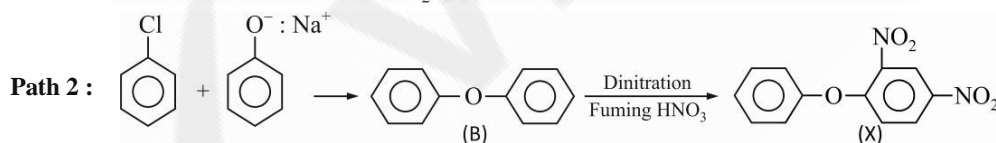
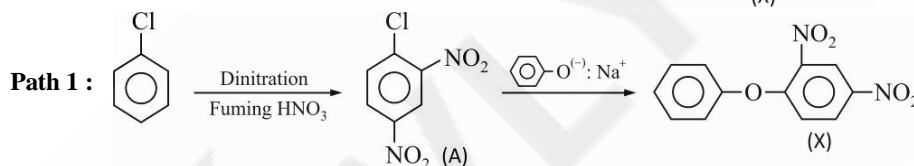
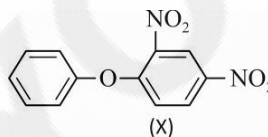
This section contains 10 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONLY ONE Choice is Correct:

1. Which of the following is an incorrect IUPAC name:
 (A) 5-ethyl-3-methylheptane (B) 3-(2,2-Di-methylpropyl) pentane
 (C) 2-ethylpentane (D) All of the above

2. Which of the following reactions would give pentan-2-ol?



3. There are two path (I and II) for the preparation of phenyl-2, 4-dinitro phenyl ether (X).



Which of the following statements is true?

- I. Path I is feasible, whereas Path II is not.
 II. Path II is feasible, whereas Path I is not.
 III. The Cl of (A) undergoes S_N reaction because it is activated by the two electron withdrawing ($-NO_2$) groups.
 IV. The nitration of (B) does not give (X) but it gives $O_2N-C_6H_4-O-C_6H_4-NO_2$ because the first nitro group is deactivating, so the second nitro group enters the other ring.

The correct choice is :

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

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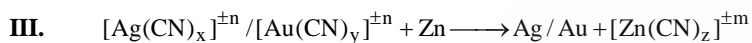
4. In which of the following cases, the oxidation state of N atom is wrongly calculated?

Compound	Oxidation state
(A) NH_4Cl	-3
(B) $(\text{N}_2\text{H}_5)_2\text{SO}_4$	+2
(C) Mg_3N_2	-3
(D) NH_2OH	-1

5. Red phosphorous reacts with alkali to give salt of hypo-phosphoric acid. The sum of number of P – OH and number of P – P bonds in the hypo phosphoric acid is:

- (A) 4 (B) 5 (C) 6 (D) 7

6. Consider the following reactions:



Find the value of x, y and z and report your answer as the sum of x, y and z.

- (A) 4 (B) 5 (C) 8 (D) 9

7. Which of the following order is correct order of stability of resonating structure of diazomethane (CH_2N_2) ?



The correct choice is :

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

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