

VIDYA DRISHTI
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IIT-JEE 2010 Test Series 2
Paper 1

Physics Part-I

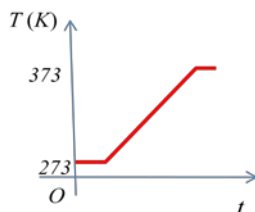
SECTION I

STRAIGHT OBJECTIVE TYPE

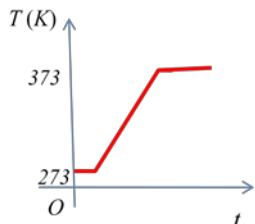
This section contains 6 multiple choice questions. Each question has four choices (a), (b), (c) and (d), out of which ONLY ONE is correct. 3 MARKS will be awarded for correct answer. 1 MARK will be deducted for wrong answer.

1. The percentage error arising from neglecting the buoyancy of air in weighing an object of relative density 12 with brass weights of relative density 8 by a physical balance is (Density of air = 1.2 kg/m^3)
a) 0.001 b) 0.005 c) 0.01 d) 0.02
2. The specific heat of water is approximately $4 \times 10^3 \text{ J K}^{-1} \text{ kg}^{-1}$ and the specific latent heats of fusion of ice and vaporization of water are approximately $3 \times 10^5 \text{ J kg}^{-1}$ and $2 \times 10^6 \text{ J kg}^{-1}$ respectively. A constant power supply is used to melt 1 kg of ice, to heat the water produced and finally to turn all the water produced and finally to turn all the water to steam. Which one of the following graphs shows how the temperature T varies with time t for this sequence:

a)

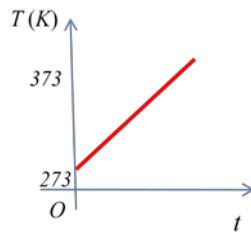


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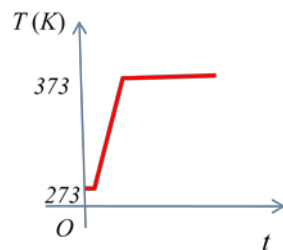


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c)

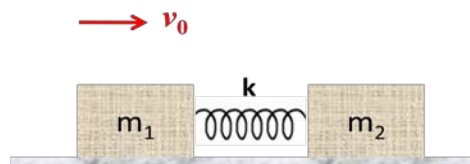


d)



3. Two blocks with masses $m_1 = 1$ kg and $m_2 = 2$ kg are connected by a spring of spring constant $k = 24$ N/m and placed on a frictionless horizontal surface. The block m_1 is imparted an initial velocity $v_0 = 12$ cm/s to the right. The amplitude of the oscillation is

- a) 1 cm
- b) 2 cm
- c) 3 cm
- d) 4 cm

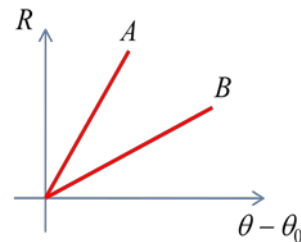


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4. The frequency of a sonometer wire is f , but when the weight producing the tensions are completely immersed in water the frequency becomes $f/2$ and by immersing the weights in a certain liquid the frequency becomes $f/3$. The specific gravity of the liquid is
- a) 1.320 b) 1.032 c) 1.413 d) 1.185
5. Two circular discs A and B with equal radii are blackened. They are heated to same temperature and cooled under identical conditions. What inference you draw from their cooling curves shown in figure?

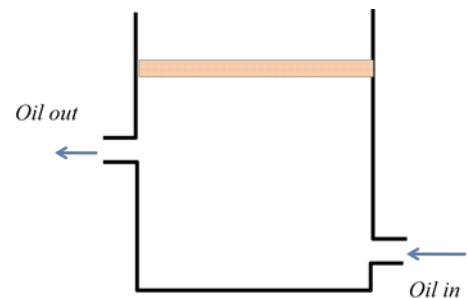
- a) A and B have same specific heats.
b) Specific heat of A is less.
c) Specific heat of B is less.
d) No inference can be drawn.



6. The top of an insulated cylindrical container is covered by a disc having emissivity 0.6 and conductivity $0.167 \text{ WK}^{-1} \text{ m}^{-1}$ and thickness 1 cm. The temperature is maintained by circulating oil as shown in figure.

The radiation loss to the surroundings in $\text{J m}^{-2} \text{ s}^{-1}$ if temperature of the upper surface of the disc is 127°C and temperature of the surrounding is 27°C is

- a) 595
b) 545
c) 495
d) None of these



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SECTION II

MULTIPLE CHOICE TYPE QUESTIONS

This section contains 6 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D), out of which ONLY ONE is correct. NO NEGATIVE marking.

7. Air is blown at the mouth of a tube which is 25 cm long and opens at both ends. Its diameter is equal to 2 cm. If the velocity of the sound is 330 m/s, then the sound emitted by the tube will have all the frequencies, in Hz, in the group
- a) 660 b) 1000 c) 1320 d) 2000
8. The density ρ of a liquid varies with depth h from the free surface as $\rho = k h$. A small body of density ρ_1 is released from the surface of liquid. The body will
- a) come to momentary rest at a depth $2\rho_1/k$ from the free surface.
b) execute simple harmonic motion about a point at a depth ρ_1/k from the surface.
c) execute simple harmonic motion of amplitude ρ_1/k .
d) never come to rest.
9. A standing wave in a tube filled with iodine gas at 400 K has nodes that are 6.77 cm apart when the frequency is 1000 vib/sec. The atomic mass of iodine is 127 amu. Then
- a) $\gamma = 0.699$
b) $\gamma = 1.4$
c) gas is monatomic
d) gas is diatomic
-

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10. A thin rod of negligible mass and area of cross-section $4 \times 10^{-6} \text{ m}^2$, suspended from end, has a length of 0.5 m at 100°C . The rod is cooled to 0°C but is prevented from contracting by attaching a mass at the lower end. Given, Young's modulus of the rod: $Y = 10^{11} \text{ N/m}^2$, coefficient of linear expansion of the rod: $\alpha = 10^{-5} \text{ K}^{-1}$, acceleration due to gravity: $g = 10 \text{ m/s}^2$. Then,
- thermal elongation of the rod is $5 \times 10^{-4} \text{ m}$
 - mechanical elongation of the rod is $5 \times 10^{-4} \text{ m}$
 - mass at the lower end of the rod is 40 kg
 - the energy stored in the rod is 0.1 J

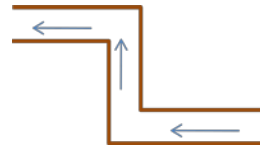
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SECTION III

ASSERTION-REASON TYPE

This question contains 4 reasoning type questions. Each question has 4 choices (a), (b), (c) and (d), out of which ONLY ONE is correct. 3 MARKS will be awarded for correct answer. 1 MARK will be deducted for wrong answer. NO MARKS WILL BE GIVEN OR DEDUCTED IF A QUESTION IS NOT ANSWERED.

11. A liquid flows through a tube of uniform cross-section with a constant speed in the direction as shown in figure.



Now consider given two statements:

Statement 1: The liquid exerts a clockwise torque on the tube.

Statement 2: As the liquid undergoes change in momentum only at the bends of the tube, hence the liquid and the tube exerts forces on each other at these locations. The two forces by liquid at these locations form a couple causing a torque.

- (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 is True, STATEMENT-2 is False
- (d) STATEMENT-1 is False, STATEMENT-2 is true
12. Statement 1: The sprinkling of water reduces the temperature of a closed room.
Statement 2: Water has a large latent heat of vaporization.
STATEMENT-1 is True, STATEMENT-2 is true; STATEMENT-2 is a correct explanation for STATEMENT 1
- (a) STATEMENT-1 is True, STATEMENT-2 is true; STATEMENT-2 is NOT a correct explanation for STATEMENT-1
- (b) STATEMENT-1 is True, STATEMENT-2 is False
- (c) STATEMENT-1 is False, STATEMENT-2 is true
13. Statement 1: A hot body has more heat energy than an otherwise identical cold body.
Statement 2: Heat is a form of energy.
- (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 is True, STATEMENT-2 is False
- (d) STATEMENT-1 is False, STATEMENT-2 is true

14. Statement 1: Once a submarine starts sinking, it will always sink to the bottom of the ocean if no other changes are made.

Statement 2: During the descent of submarine hydrostatic force acting on it increases.

- (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 is True, STATEMENT-2 is False
- (d) STATEMENT-1 is False, STATEMENT-2 is true

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SECTION IV

LINKED COMPREHENSION TYPE

This section contains 2 paragraphs. Based upon each paragraph, 3 multiple choice questions have to be answered. Each question has four choices (a), (b), (c) and (d), out of which ONLY ONE is correct. 4 MARKS will be awarded for correct answer. 1 MARK will be deducted for wrong answer. NO MARKS WILL BE GIVEN OR DEDUCTED IF A QUESTION IS NOT ANSWERED.

Paragraph for Questions numbers 15 to 17

A string of linear mass density 0.5 g/cm and a total length 30 cm is tied to a fixed wall at one end and to a frictionless ring at the other end. The ring can move on a vertical rod. A wave pulse is produced on the string which moves towards the ring at a speed 20 cm/s. The pulse is symmetric about its maximum which is located at a distance 20 cm from the end joining to the ring. Answer the following questions based on this passage.

15. Assume that the wave is reflected from the ends without loss of energy. The time taken by the string to regain its shape is
- a) 1 s b) 2 s c) 3 s d) 6 s
16. The shape of the string changes periodically with time. This time period is
- a) 1 s b) 2 s c) 3 s d) 6 s
17. The tension in the string is
- a) 2×10^{-3} N b) 3×10^{-3} N c) 4×10^{-3} N d) 6×10^{-3} N
-

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Paragraph for Questions numbers 18 to 20

The air column in a pipe closed at one end is made to vibrate in its second overtone by atuning fork of frequency 440 Hz. The speed of sound in air is 330 m/s. End corrections may be neglected. Let P_0 denote the mean pressure at any point in the pipe, and ΔP_0 the maximum amplitude of pressure variation. Answer the following questions based on this passage:

18. The amplitude of pressure variation at the middle of the column is
a) ΔP_0 b) $\Delta P_0/\sqrt{2}$ c) $\Delta P_0/2$ d) $\sqrt{2}\Delta P_0$
19. The length of the air column is
a) 25 cm b) 93.75 cm c) 127.5 cm d) 12.5 cm
20. The maximum and minimum pressure at the closed end of the pipe are ,
a) $P_0 + \Delta P_0$ and $P_0 - \Delta P_0$ respectively
b) $P_0 + \Delta P_0/2$ and $P_0 - \Delta P_0/2$ respectively
c) $P_0 + \Delta P_0/\sqrt{2}$ and $P_0 - \Delta P_0/\sqrt{2}$ respectively
d) $P_0 + \sqrt{2}\Delta P_0$ and $P_0 - \sqrt{2}\Delta P_0$ respectively

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Paragraph for Questions numbers 21 to 23

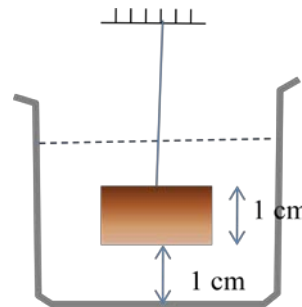
A tank of base area 4 m^2 is initially filled with water up to height 2 m . An object of uniform cross-section 2 m^2 and height 1 m is now suspended by a wire into the tank, keeping the distance between base of tank and that of object 1 m . Density of the object is 2000 kg/m^3 . Take atmospheric pressure 10^5 N/m^2 and $g = 10 \text{ m/s}^2$. Answer the following questions based on this paragraph:

21. The downward force exerted by the water on the top surface of the object is

- a) $2.0 \times 10^5 \text{ N}$
- b) $2.1 \times 10^5 \text{ N}$
- c) $2.2 \times 10^5 \text{ N}$
- d) $2.3 \times 10^5 \text{ N}$

22. The tension in the wire is

- a) $0.1 \times 10^5 \text{ N}$
- b) $0.2 \times 10^5 \text{ N}$
- c) $0.3 \times 10^5 \text{ N}$
- d) $0.4 \times 10^5 \text{ N}$



23. The buoyant force on the wire is

- a) $0.1 \times 10^5 \text{ N}$
- b) $0.2 \times 10^5 \text{ N}$
- c) $0.3 \times 10^5 \text{ N}$
- d) $0.4 \times 10^5 \text{ N}$

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IIT-JEE 2010 Test Series 2
Paper 1

Mathematics Part-I

SECTION I

STRAIGHT OBJECTIVE TYPE

This section contains 6 multiple choice questions. Each question has four choices (a), (b), (c) and (d), out of which ONLY ONE is correct. 3 MARKS will be awarded for correct answer. 1 MARK will be deducted for wrong answer.

1. If $a = \frac{1}{4} + i\frac{\sqrt{3}}{4}$ and $z = x+iy$ then $\sin^{-1}|2|^2 + \cos^{-1}(a\bar{z} + \bar{a}z - 2)$ equals to
i) 0 ii) $\pi/4$ iii) $\pi/2$ iv) $5\pi/2$

2. If $x_n > x_{n-1} > \dots \dots \dots x_2 > x_1 > 1$, then the value of $\log_{x_1} \log_{x_2} \dots \dots \dots \log_{x_n} (x_n)^{x_{n-1}}$ is
i) 1 ii) 0 iii) 2 iv) None of these

3. $\sin^{-1}\left(\frac{x^2}{4} + \frac{y^2}{9}\right) + \cos^{-1}\left(\frac{x}{2\sqrt{2}} + \frac{y}{3\sqrt{2}} - 2\right)$ equals to
i) $\pi/2$ ii) π iii) $\pi/\sqrt{2}$ iv) $3\pi/2$

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4. The values of α for which the point (α, α^2) lies inside the triangle formed by the lines $2x+3y-1=0$, $x+2y-3=0$ and $5x-6y-1=0$ is

i) $(-\infty, -1) \cup (1/3, \infty)$ ii) $(-3/2, -1) \cup (1/2, 1)$ iii) $(-\infty, 1/3) \cup (1/2, \infty)$ iv) $(-3/2, 1/3) \cup (1/2, \infty)$

5. If the distance of any point (x, y) from the origin is defined as $d(x, y) = \max\{|x|, |y|\}$, $d(x, y) = a$ non zero constant then the locus is

i) a circle ii) a straight line iii) a square iv) a triangle

6. The equation $x^{3/4}(\log_2 x)^2 + \log_2 x - 5/4 = \sqrt{2}$ has

i) at least one real solution ii) exactly three real solution iii) exactly one irrational solution
iv) complex roots

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SECTION II

MULTIPLE CHOICE TYPE QUESTIONS

This section contains 6 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D), out of which ONLY ONE is correct. NO NEGATIVE marking.

7. Internal bisector of $\angle A$ of triangle ABC meets side BC at D. A line drawn through D perpendicular to AD intersects the side AC at E and side AB at F. If a,b,c represents sides of ΔABC then

i) AE is HM of b and c

ii) $AD = \frac{2bc}{a+c} \cos \frac{A}{2}$

iii) $BF = \frac{4bc}{b+c} \sin \frac{A}{2} \frac{\sqrt{3+\sqrt{2}}}{\sqrt{2}}$

iv) The triangle AEF is isosceles

8. In a triangle ABC, point D and E are taken on side BC such that $BD = DE = EC$. If the angle $AED = \theta$, then

i) $\tan \theta = 3 \tan B$

ii) $3 \tan \theta = \tan C$

iii) $\frac{6 \tan \theta}{\tan^2 \theta - 9} = \tan A$

iv) angle B = angle C

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9. Three equal circles of radii unity touches one another. Radii of circle touching all the three circle is

i) $\frac{2-\sqrt{3}}{\sqrt{3}}$ ii) $\frac{\sqrt{3}-\sqrt{2}}{\sqrt{2}}$ iii) $\frac{2+\sqrt{3}}{\sqrt{3}}$ iv) $\frac{\sqrt{3}+\sqrt{2}}{\sqrt{2}}$

10. The eqn. of the circle which touches both the axes and the line $\frac{x}{3} + \frac{y}{4} = 1$ and lies in the first

quadrant is $(x-c)^2 + (y-c)^2 = c^2$ where c is

i)1 ii)2 iii)4 iv)6

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SECTION III

ASSERTION-REASON TYPE

This question contains 4 reasoning type questions. Each question has 4 choices (a), (b), (c) and (d), out of which ONLY ONE is correct. 3 MARKS will be awarded for correct answer. 1 MARK will be deducted for wrong answer. NO MARKS WILL BE GIVEN OR DEDUCTED IF A QUESTION IS NOT ANSWERED.

11. Statement-I: If α, β are roots of $6x^2 + 11x + 3 = 0$ then $\cos^{-1}\alpha$ exists but not $\cos^{-1}\beta$, ($\alpha > \beta$)

Statement-II: Domain of $\cos^{-1}x$ is $[-1, 1]$

- 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 is True, STATEMENT-2 is False
- d) STATEMENT-1 is False, STATEMENT-2 is true

12. Statement-I: $\tan^2(\sec^{-1}2) + \cot^2(\operatorname{cosec}^{-1}3) = 11$.

Statement-II: $\tan^2\theta + \sec^2\theta = 1 = \cot^2\theta + \operatorname{cosec}^2\theta$

- 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 is True, STATEMENT-2 is False
- d) STATEMENT-1 is False, STATEMENT-2 is true

13. Statement-I: If $a > 0$, $b > 0$, $\tan^{-1}(a/x) + \tan^{-1}(b/x) = \pi/2 \Rightarrow \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & -2 & 4 \end{pmatrix} x = \sqrt{ab}$

Statement-II: If $m, n \in \mathbb{N}$, $n \geq m$ then $\tan^{-1}\left(\frac{m}{n}\right) + \tan^{-1}\left(\frac{n-m}{m-n}\right) = \pi/4$

- 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 is True, STATEMENT-2 is False
- d) STATEMENT-1 is False, STATEMENT-2 is true

14. Consider the system of equations $x-2y+3z=-1$, $x-3y+4z=1$ and $-x+y-2z=k$
Statement -I : The system of equations has no solution for $k \neq 3$.

Statement-II : The determinant $\begin{vmatrix} 1 & 3 & -1 \\ -1 & -2 & k \\ 1 & 4 & 1 \end{vmatrix} \neq 0$ for $k \neq 0$

- 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 is True, STATEMENT-2 is False
d) STATEMENT-1 is False, STATEMENT-2 is true
-

SPACE FOR ROUGH WORK

SECTION IV

LINKED COMPREHENSION TYPE

This section contains 2 paragraphs. Based upon each paragraph, 3 multiple choice questions have to be answered. Each question has four choices (a), (b), (c) and (d), out of which ONLY ONE is correct. 4 MARKS will be awarded for correct answer. 1 MARK will be deducted for wrong answer. NO MARKS WILL BE GIVEN OR DEDUCTED IF A QUESTION IS NOT ANSWERED.

Paragraph for Questions numbers 15 to 17

Read the following passage and answer the questions

$$A = \begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{pmatrix}, \text{ if } U_1, U_2 \text{ and } U_3 \text{ are column matrices satisfying}$$

$$AU_1 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, AU_2 = \begin{bmatrix} 2 \\ 3 \\ 0 \end{bmatrix}, AU_3 = \begin{bmatrix} 2 \\ 3 \\ 1 \end{bmatrix} \text{ and } U \text{ is } 3 \times 3 \text{ matrix}$$

Whose columns are U_1, U_2 and U_3 , then answer the following

15. The value of $|U|$ is
 i) 3 ii) -3 iii) 3/2 iv) 2

16. The sum of elements of U^{-1} is
 i) -1 ii) 0 iii) 1 iv) 3

17. The value of $[3 \ 2 \ 0] U \begin{bmatrix} 3 \\ 2 \\ 0 \end{bmatrix}$ is
 i) [5] ii) [5/2] iii) [4] iv) [3/2]

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Paragraph for Questions numbers 18 to 20

Let S_1, S_2, S_3 be the circles $x^2+y^2+3x+2y+1=0$, $x^2+y^2-x+6y+5=0$ and $x^2+y^2+5x-8y+15=0$, then

18. Point from which length of tangent to these circles is same is

- i)(1,0) ii)(3,2) iii)(10,5) iv)(-2,1)

19. Eqn of circle S_4 which cuts orthogonally to all given circle is

- i) $x^2+y^2-6x+4y-14=0$ ii) $x^2+y^2+6x+4y-14=0$
iii) $x^2+y^2-6x-4y+14=0$ iv) $x^2+y^2-6x-4y-14=0$

20. Radial centre of circles S_1, S_2 , and S_4 is

- i) $(-3/5, -8/5)$ ii) $(8,2)$ iii) $(1,0)$ iv) $(-4/5, -3/2)$
-

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Paragraph for Questions numbers 21 to 23

G is the centroid of triangle ABC. Perpendiculars from vertices A,B,C meet the sides BC,CA,AB respectively. P,Q,R are feet of perpendiculars from G on sides BC,CA,AB respectively. L,M,N are the mid points of sides BC,CA,AB respectively, then

21. Length of the side PG is

i) $\frac{1}{2} b \sin C$ ii) $\frac{1}{2} c \sin C$ iii) $\frac{2}{3} b \sin C$ iv) $\frac{1}{3} c \sin B$

22. (Area of ΔGPL) to (Area of ΔALD) is equal to

i) $\frac{1}{3}$ ii) $\frac{1}{9}$ iii) $\frac{2}{3} \frac{1}{3}$ iv) $\frac{4}{9}$

23. Area of ΔPQR is

i) $\frac{1}{9} (a^2+b^2+c^2) \sin A \sin B \sin C$ ii) $\frac{1}{18} (a^2+b^2+c^2) \sin A \sin B \sin C$
iii) $\frac{2}{9} (a^2+b^2+c^2) \sin A \sin B \sin C$ iv) $\frac{1}{3} (a^2+b^2+c^2) \sin A \sin B \sin C$

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IIT-JEE 2010 Test Series 2
Paper 1

Chemistry Part-I

SECTION I

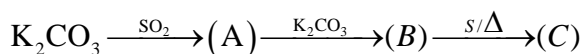
STRAIGHT OBJECTIVE TYPE

This section contains 6 multiple choice questions. Each question has four choices (a), (b), (c) and (d), out of which ONLY ONE is correct. 3 MARKS will be awarded for correct answer. 1 MARK will be deducted for wrong answer.

1. 1. 50 ml of 1M oxalic acid (hydrated) is shaken with 0.5g wood charcoal .The final concentration of the solution after adsorption is 0.5ml What is the amount of oxalic acid adsorbed per unit mass of carbon ?

- (a) 3.15g
- (b) 3.45g
- (c) 6.6g
- (d) 12.6g

2. Identify the compound (C) in the following sequence of reaction,



- (a) K_2S
 - (b) $\text{K}_2\text{S}_2\text{O}_3$
 - (c) K_2SO_3
 - (d) none of these
-

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3. Dinitrogen can be purified from the impurities of oxides of nitrogen and ammonia by passing through:
- (a) conc. HCl
 - (b) alkaline solution of pyrogallol
 - (c) acidified sol. Of potassium dichromate
 - (d) An aq. Sol. Of KOH
4. Which of the following is not correct
- (a) the oxides of alkaline earth metal is more basic than those of alkali metal.
 - (b) The bicarbonates of calcium and magnesium are stable crystalline substance.
 - (c) Sodium bicarbonate is more soluble than sodium carbonate.
 - (d) Anhydrous magnesium chloride can be obtained by heating hydrated magnesium chloride
5. Which of the following statement for a crystal having frenkel defect is not correct:
- (a) Frenkel defects are observed where the difference in sizes of cations and anions is large
 - (b) The density of crystals having frenkel defect is lesser than pure perfect crystal
 - (c) An ionic crystal may have frenkel defect along with schottky defect.
 - (d) pure alkali halides do not have frankel defect.
6. Which of the following is not the characteristic of chemisorption?
- (a) Adsorption is irreversible
 - (b) ΔH is of order 900KJ
 - (c) Adsorption is specific
 - (d) adsorption increases on increasing the surface area.

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SECTION II

MULTIPLE CHOICE TYPE QUESTIONS

This section contains 6 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D), out of which ONLY ONE is correct. NO NEGATIVE marking.

7. Which of the following is correct about diborane?
- (a) It is colourless and highly toxic gas
 - (b) It spontaneously catches fire on exposure to air.
 - (c) When it is heated with ammonia it forms borazine.
 - (d) This molecule is planar
8. Which of the following equation represent freundlich adsorption isotherm?
- (a) $x/m = k (p)^{1/n}$ where x is the amount of gas adsorbed on mass m at pressure p
 - (b) $\log (x/m) = \log e + 1/n \log P$
 - (c) $x/m = K.P$ at low pressure
 - (d) $x/m = k$ at high pressure
9. Which of the following plots represent an ideal binary mixture of two volatile liquids A & B?
- (a) Plot of P_{total} vs X_B is linear (X_B = mole fraction of B in solution phase)
 - (b) Plot of P_{total} vs Y_A is linear (Y_A = mole fraction of A in vapour phase)
 - (c) Plot $1/P_{\text{total}}$ vs Y_A is linear
 - (d) Plot $1/P_{\text{total}}$ vs Y_B is non linear
10. In a body centered cubic unit cell of A_2 type
- (a) The edge length is equal to $4R/\sqrt{3}$
 - (b) The edge length is equal to $2R^2 + 2R^2$
 - (c) The edge length is equal to $2d/\sqrt{3}$ where d is the shortest distance between two atoms forming BCC lattice .
 - (d) The square of the edge length is equal to $16R^2$ where "R" is the radius of an atom forming BCC lattice

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SECTION III

ASSERTION-REASON TYPE

This question contains 4 reasoning type questions. Each question has 4 choices (a), (b), (c) and (d), out of which ONLY ONE is correct. 3 MARKS will be awarded for correct answer. 1 MARK will be deducted for wrong answer. NO MARKS WILL BE GIVEN OR DEDUCTED IF A QUESTION IS NOT ANSWERED.

11. Statement 1: solution of sodium hydroxide can be stored in vessel made of Al or Zn .
Statement 2: sodium ferrite on treatment with hot water produces sodium hydroxides
- STATEMENT-1 is True, STATEMENT-2 is true; STATEMENT-2 is a correct explanation for STATEMENT 1
 - STATEMENT-1 is True, STATEMENT-2 is true; STATEMENT-2 is NOT a correct explanation for STATEMENT-1
 - STATEMENT-1 is True, STATEMENT-2 is False
 - STATEMENT-1 is False, STATEMENT-2 is true
12. Statement 1: Potassium carbonate can be prepared by solvay process just like sodium carbonate by taking potassium carbonate as starting material .
Statement 2: potassium carbonate is obtained as one of the product when potassium peroxide reacts with carbon dioxide.
- STATEMENT-1 is True, STATEMENT-2 is true; STATEMENT-2 is a correct explanation for STATEMENT 1
 - STATEMENT-1 is True, STATEMENT-2 is true; STATEMENT-2 is NOT a correct explanation for STATEMENT-1
 - STATEMENT-1 is True, STATEMENT-2 is False
 - STATEMENT-1 is False, STATEMENT-2 is true
13. Statement 1: For a same metal density will be higher in FCC lattice than in BCC.
Statement 2: Edge length in FCC lattice will be larger than in BCC lattice .
- STATEMENT-1 is True, STATEMENT-2 is true; STATEMENT-2 is a correct explanation for STATEMENT 1
 - STATEMENT-1 is True, STATEMENT-2 is true; STATEMENT-2 is NOT a correct explanation for STATEMENT-1
 - STATEMENT-1 is True, STATEMENT-2 is False
 - STATEMENT-1 is False, STATEMENT-2 is true

14. Statement 1: Physical adsorption on a surface requires activation energy.
Statement 2: Physical adsorption is due to van der Waals force of attraction between adsorbent and adsorbate.
- 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 is True, STATEMENT-2 is False
 - d) STATEMENT-1 is False, STATEMENT-2 is true

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SECTION IV

LINKED COMPREHENSION TYPE

This section contains 2 paragraphs. Based upon each paragraph, 3 multiple choice questions have to be answered. Each question has four choices (a), (b), (c) and (d), out of which ONLY ONE is correct. 4 MARKS will be awarded for correct answer. 1 MARK will be deducted for wrong answer. NO MARKS WILL BE GIVEN OR DEDUCTED IF A QUESTION IS NOT ANSWERED.

Paragraph for Questions numbers 15 to 17

Thin coins of diameter 10 mm each are to be placed on a flat surface bounded by four lines (of same thickness as that of coin) of length 40 mm each in such a way that centre c of coin must not lie outside the specified area. All the coin must form only one layer. Two different arrangements are possible for arranging these coins. In first arrangement, each coin is touched by four neighbouring coin (arrangement A). In second arrangement, each coin is touched by six neighbouring coin (Arrangement B).

15. How many maximum effective coins can be placed on the surface bounded by above four lines?
- | | |
|--------|--------|
| (a) 16 | (b) 18 |
| (c) 23 | (d) 25 |
16. What will be radius of Largest coin, that can be placed on vacant surface in arrangement A, without disturbing the coins?
- | | |
|-------------|------------|
| (a) 1.54mm | (b) 4.14mm |
| (c) 0.775mm | (d) 2.07mm |
17. What will be radius of largest coin, placed on the vacant surface in arrangement B, without disturbing other coins?
- | | |
|------------|------------|
| (a) 2.54mm | (b) 4.14mm |
| (c) 0.77mm | (d) 2.07mm |
-

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Paragraph for Questions numbers 18 to 20

Properties which depend only on concentration of solute particles in solution and not on the identity of the solute is called colligative property. There may be change in number of moles of solute due to ionization or association hence these properties are also affected. The number of moles of the product is related to degree of ionization or association by vant Hoff factor, i given by

$i = [1 + (n-1) \alpha]$ for dissociation & $i = [1 + (1/n - 1) \alpha]$ for association, where n is the number of product obtained per mole of reactant.

A dilute solution contains “ t ” moles of solute X in 1 kg of solvent with molal elevation constant K_b . The solute dimerises in the solution. The degree of association is α .

18. The Vant Hoff factor will be (if we start with one mole of X):

- (a) $i = 1 - 2\alpha$ (b) $i = 1 - \alpha/2$ (c) $i = 1 + \alpha/2$ (d) $i = 1 + \alpha$

19. The colligative properties observed will be :

- (a) $\Delta P_{obs} > \Delta P_{actual}$ $\Delta T_{b_{obs}} > \Delta T_{b_{actual}}$ $\Delta T_{f_{obs}} > \Delta T_{f_{actual}}$
 (b) $\Delta P_{obs} = \Delta P_{actual}$ $\Delta T_{b_{obs}} = \Delta T_{b_{actual}}$ $\Delta T_{f_{obs}} = \Delta T_{f_{actual}}$
 (c) $\Delta P_{obs} < \Delta P_{actual}$ $\Delta T_{b_{obs}} < \Delta T_{b_{actual}}$ $\Delta T_{f_{obs}} < \Delta T_{f_{actual}}$
 (d) $\Delta P_{obs} > \Delta P_{actual}$ $\Delta T_{b_{obs}} = \Delta T_{b_{actual}}$ $\Delta T_{f_{obs}} < \Delta T_{f_{actual}}$

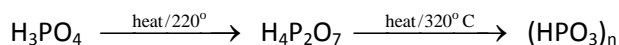
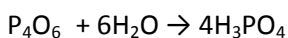
20. The equilibrium constant for the process can be expressed as

- (a) $K = (K_b t / \Delta T_b) / (1 - K_b t / \Delta T_f)$
 (b) $K = K_b (K_b t - \Delta T_b) / [2\Delta T_b - K_b t]^2$
 (c) $K = 2[(K_b t - \Delta T_b) / \Delta T_b] / 2t[1 - 2(K_b t - \Delta T_b)^2 / \Delta T_b]$
 (d) $K = \Delta T_{b_{obs}} / \Delta T_{f_{obs}}$

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Paragraph for Questions numbers 21 to 23

Phosphorous forms a number of acid. It form two series of oxoacids . The phosphoric series of acids, in which the oxidation state of phosphorous is positive and in which the compound have reducing properties .



21. The correct statement regarding all oxyacids of phosphorous :

- (a) All oxyacids are reducing
- (b) In all oxyacids, phosphorous is sp^3 hybridised
- (c) Oxyacids of phosphorous are tribasic
- (d) $H_5P_3O_7$ is tetra basic.

22. The number of $d\pi-p\pi$ bond in $(HPO_3)_4$ is:

- (a) 8
- (b) 4
- (c) zero
- (d) 6

23. The correct sequence of acidic strength is :

- (a) $(HPO_3)_n > H_3PO_2 > H_3PO_3 > H_3PO_4$
- (b) $(HPO_3)_n > H_3PO_4 > H_3PO_3 > H_3PO_2$
- (c) $H_3PO_4 > H_3PO_3 > H_3PO_2 > (HPO_3)_n$
- (d) $H_3PO_2 > H_3PO_3 > H_3PO_4 > (HPO_3)_n$

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