



Q.1 A physical quantity P is described by the relation

$$P = a^{1/2} b^2 c^3 d^{-4}$$

If the relative errors in the measurement of a, b, c and d respectively, are 2%, 1%, 3% and 5%, then the relative error in P will be :

- (1) 8% (2) 12% (3) 32% (4) 25%

Q.1 एक भौतिक राशि P निम्न संबंध द्वारा परिभाषित की जाती है।

$$P = a^{1/2} b^2 c^3 d^{-4}$$

यदि a, b, c और d के मापन में सापेक्ष त्रुटि क्रमशः 2%, 1%, 3% व 5% हो तो P में सापेक्ष त्रुटि होगी :

- (1) 8% (2) 12% (3) 32% (4) 25%

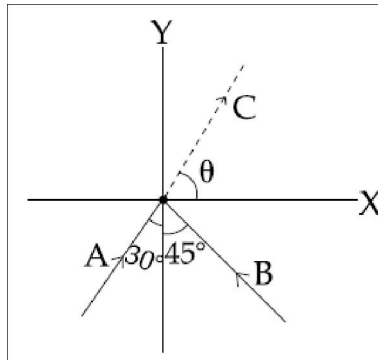
Q.2 A car is standing 200 m behind a bus, which is also at rest. The two start moving at the same instant but with different forward accelerations. The bus has acceleration 2 m/s^2 and the car has acceleration 4 m/s^2 . The car will catch up with the bus after a time of :

- (1) $\sqrt{110} \text{ s}$ (2) $\sqrt{120} \text{ s}$ (3) $10\sqrt{2} \text{ s}$ (4) 15 s

Q.2 एक कार एक ठहरी हुई बस से 200 m पीछे खड़ी है। दोनों एक ही क्षण अलग-अलग अग्रदिशिक त्वरण से चलना शुरू करते हैं। बस का त्वरण 2 m/s^2 तथा कार का त्वरण 4 m/s^2 है। कितने समय बाद यह कार बस तक पहुँच जायेगी?

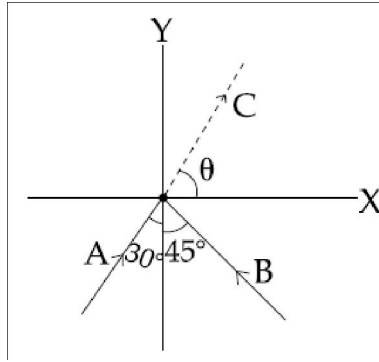
- (1) $\sqrt{110} \text{ s}$ (2) $\sqrt{120} \text{ s}$ (3) $10\sqrt{2} \text{ s}$ (4) 15 s

Q.3 Two particles A and B of equal mass M are moving with the same speed v as shown in the figure. They collide completely inelastically and move as a single particle C. The angle θ that the path of C makes with the X-axis is given by :



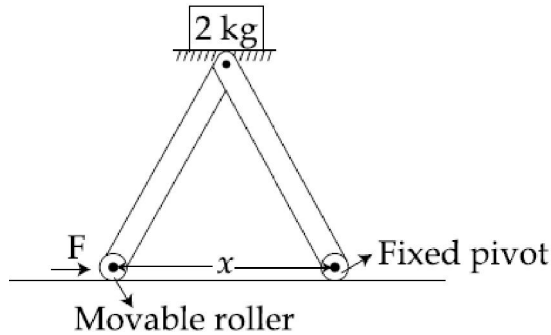
- (1) $\tan \theta = \frac{\sqrt{3} + \sqrt{2}}{1 - \sqrt{2}}$ (2) $\tan \theta = \frac{\sqrt{3} - \sqrt{2}}{1 - \sqrt{2}}$ (3) $\tan \theta = \frac{1 - \sqrt{2}}{\sqrt{2}(1 + \sqrt{3})}$ (4) $\tan \theta = \frac{1 - \sqrt{3}}{1 + \sqrt{2}}$

- Q.3 समान द्रव्यमान M के दो कण A तथा B समान चाल u से चित्रानुसार चल रहे हैं। वह पूर्णतया अप्रत्यास्थ संघट्ट करते हैं तथा संघट्ट के बाद एक कण C की तरह चलते हैं। कोण θ , जो कण C का पथ X -अक्ष से बनाता है, को निम्न सम्बन्ध T से दिया जायेगा:

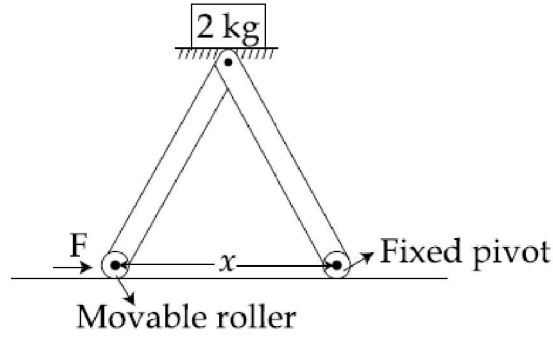


(1) $\tan \theta = \frac{\sqrt{3} + \sqrt{2}}{1 - \sqrt{2}}$ (2) $\tan \theta = \frac{\sqrt{3} - \sqrt{2}}{1 - \sqrt{2}}$ (3) $\tan \theta = \frac{1 - \sqrt{2}}{\sqrt{2}(1 + \sqrt{3})}$ (4) $\tan \theta = \frac{1 - \sqrt{3}}{1 + \sqrt{2}}$

- Q.4 The machine as shown has 2 rods of length 1 m connected by a pivot at the top. The end of one rod is connected to the floor by a stationary pivot and the end of the other rod has a roller that rolls along the floor in a slot. As the roller goes back and forth, a 2 kg weight moves up and down. If the roller is moving towards right at a constant speed, the weight moves up with a :

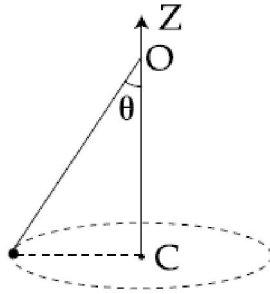


- (1) constant speed
 (2) decreasing speed
 (3) increasing speed
 (4) speed which is $\frac{3}{4}$ th of that of the roller when the weight is 0.4 m above the ground
- Q.4 चित्र में दिखायी गयी एक मशीन की दो छड़ों, जिनकी लम्बाई 1 m है, के ऊपरी सिरों को एक साथ धुराग्रस्त किया गया है। एक छड़ का आखिरी सिरा एक स्थिर धुरी द्वारा फर्श से जोड़ा गया है तथा दूसरी छड़ के आखिरी सिरे पर एक रोलर लगा है जो कि फर्श पर बने खाँचे में चलता है। जब वह रोलर आगे पीछे चलता है तो एक 2 kg का भार ऊपर नीचे चलता है। यदि रोलर दाहिनी दिशा में एक समान चाल से चलता है तो वह भार चलेगा, एक :



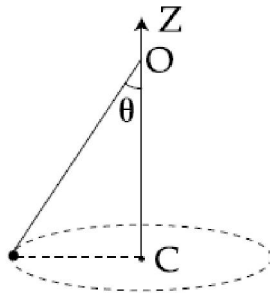
- (1) समान चाल से
- (2) घटती हुई चाल से
- (3) बढ़ती हुई चाल से
- (4) चाल जो कि रोलर की चाल का $\frac{3}{4}$ है जब वह भार फर्श से 0.4 m की ऊँचाई पर है

Q.5 A conical pendulum of length 1 m makes an angle $\theta = 45^\circ$ w.r.t. Z-axis and moves in a circle in the XY plane. The radius of the circle is 0.4 m and its center is vertically below O. The speed of the pendulum, in its circular path, will be : (Take $g=10 \text{ ms}^{-2}$)



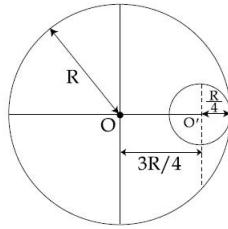
- (1) 0.4 m/s
- (2) 4 m/s
- (3) 0.2 m/s
- (4) 2 m/s

Q.5 एक शांकव (conical) दोलक, जिसकी लम्बाई 1 m है और जो Z = अक्ष से $\theta = 45^\circ$ के कोण पर है, XY समतल में एक गोलाकार पथ में चलता है। गोलाकार पथ की त्रिज्या 0.4 m है और उसका केन्द्र बिन्दु O के ठीक नीचे है। उस दोलक की गति गोलाकार पथ में होगी : ($g=10 \text{ ms}^{-2}$)



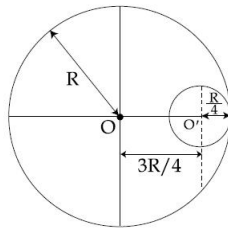
- (1) 0.4 m/s
- (2) 4 m/s
- (3) 0.2 m/s
- (4) 2 m/s

Q.6 A circular hole of radius $\frac{R}{4}$ is made in a thin uniform disc having mass M and radius R , as shown in figure. The moment of inertia of the remaining portion of the disc about an axis passing through the point O and perpendicular to the plane of the disc is :



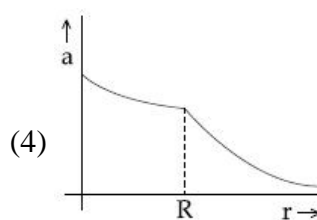
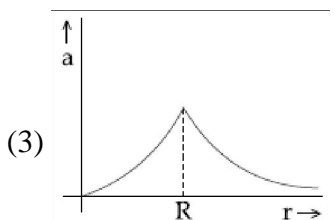
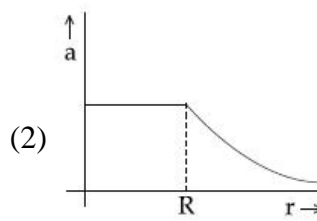
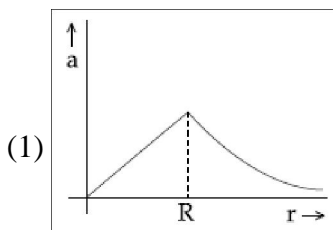
- (1) $\frac{219MR^2}{256}$ (2) $\frac{237MR^2}{512}$ (3) $\frac{19MR^2}{512}$ (4) $\frac{197MR^2}{256}$

Q.6 द्रव्यमान M तथा त्रिज्या R वाले एकसमान डिस्क में एक $\frac{R}{4}$ त्रिज्या का गोलाकार छेद, चित्रानुसार किया गया है। बिंदु O से जाने वाले तथा डिस्क के समतल के लम्बवत् अक्ष के सापेक्ष, डिस्क के बचे हुए भाग का, जड़त्व आघूर्ण होगा :

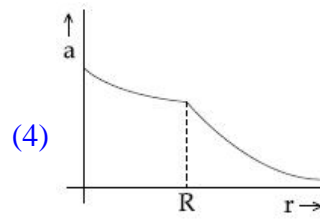
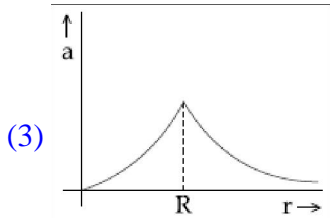
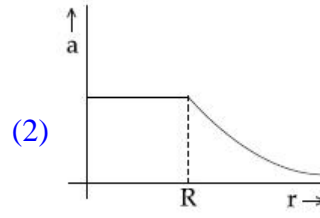
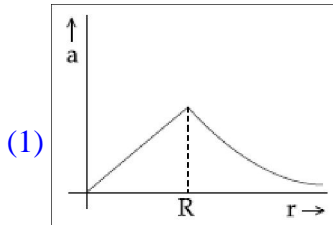


- (1) $\frac{219MR^2}{256}$ (2) $\frac{237MR^2}{512}$ (3) $\frac{19MR^2}{512}$ (4) $\frac{197MR^2}{256}$

Q.7 The mass density of a spherical body is given by $\rho(r) = \frac{k}{r}$ for $r \leq R$ and $\rho(r) = 0$ for $r > R$, where r is the distance from the centre. The correct graph that describes qualitatively the acceleration a of a test particle as a function of r is :



Q.7 एक गोलाकार पिण्ड का द्रव्यमान घनत्व है $\rho(r) = \frac{k}{r}$ जब $r \leq R$ तथा $\rho(r) = 0$ जब $r > R$, जहाँ r केन्द्र से दूरी है। निम्न में से कौन सा ग्राफ एक परीक्षण कण के त्वरण a को r के फलन में गुणात्मक रूप से दर्शाता है ?



Q.8 A steel rail of length 5 m and area of cross section 40 cm^2 is prevented from expanding along its length while the temperature rises by 10°C . If coefficient of linear expansion and Young's modulus of steel are $1.2 \times 10^{-5} \text{ K}^{-1}$ and $2 \times 10^{11} \text{ Nm}^{-2}$ respectively, the force developed in the rail is approximately :

- (1) $2 \times 10^7 \text{ N}$ (2) $1 \times 10^5 \text{ N}$ (3) $2 \times 10^9 \text{ N}$ (4) $3 \times 10^{-5} \text{ N}$

Q.8 5 m लम्बाई तथा 40 cm^2 अनुप्रस्थ काट के क्षेत्रफल की एक स्टील की पटरी का लम्बाई के अनुदिश विस्तारण रोका जाता है जबकि उसका तापमान 10°C बढ़ाया जाता है। यदि स्टील का रेखीय प्रसार गुणांक तथा यंग प्रत्यास्थता गुणांक क्रमशः $1.2 \times 10^{-5} \text{ K}^{-1}$ तथा $2 \times 10^{11} \text{ Nm}^{-2}$ हैं तो पटरी में उत्पन्न बल का निकटतम मान होगा :

- (1) $2 \times 10^7 \text{ N}$ (2) $1 \times 10^5 \text{ N}$ (3) $2 \times 10^9 \text{ N}$ (4) $3 \times 10^{-5} \text{ N}$

Q.9 Two tubes of radii r_1 and r_2 and lengths l_1 and l_2 respectively, are connected in series and a liquid flows through each of them in stream line conditions. P_1 and P_2 are pressure difference across the two tubes.

If P_2 is $4P_1$ and l_2 is $\frac{l_1}{4}$, then radius r_2 will be equal to :

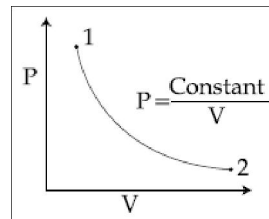
- (1) r_1 (2) $2r_1$ (3) $4r_1$ (4) $\frac{r_1}{2}$

Q.9 दो नलियाँ जिनकी त्रिज्यायें क्रमशः r_1 एवं r_2 तथा लम्बाईयों, l_1 व l_2 हैं, को श्रेणी क्रम में जोड़ा गया है और उनमें एक द्रव धारा रेखीय प्रवाह में बहता है। पहली तथा दूसरी नली के सिरों के बीच के दाबान्तर क्रमशः P_1 तथा P_2 हैं। यदि

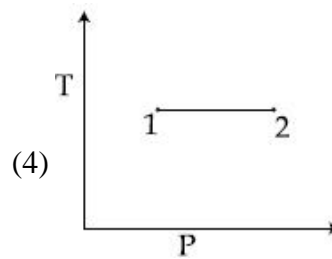
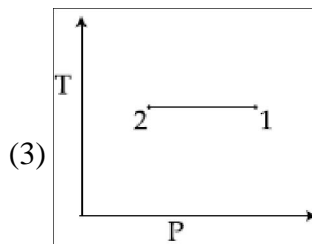
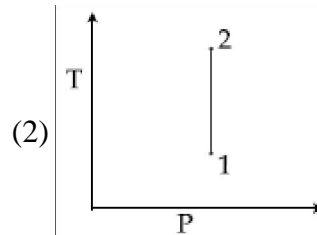
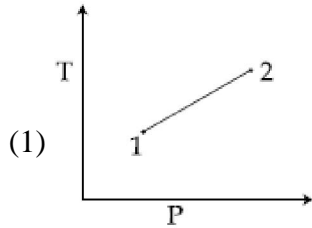
P_2 का मान $4P_1$ तथा l_2 का मान $\frac{l_1}{4}$ हो तो त्रिज्या r_2 का मान होगा :

- (1) r_1 (2) $2r_1$ (3) $4r_1$ (4) $\frac{r_1}{2}$

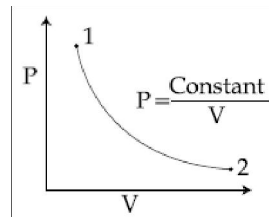
Q.10 For the P-V diagram given for an ideal gas,



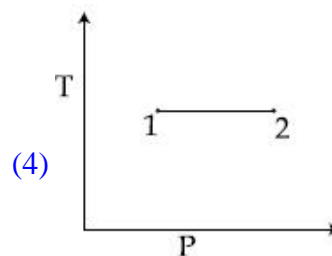
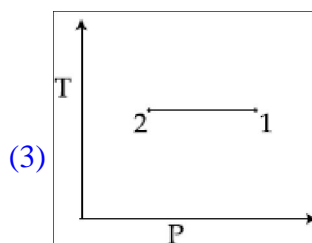
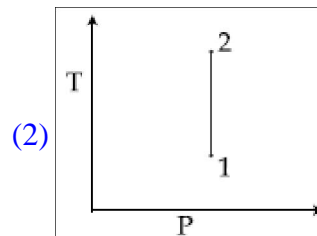
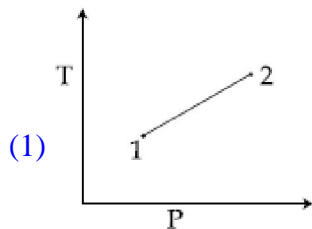
out of the following which one correctly represents the T-P diagram ?



Q.10 एक आदर्श गैस का P-V आरेख दिये गये चित्र में दर्शाया गया है।



दिये गये आरेखों में से कौन-सा सही T-P आरेख दर्शायेगा ?



Q.11 N moles of a diatomic gas in a cylinder are at a temperature T. Heat is supplied to the cylinder such that the temperature remains constant but n moles of the diatomic gas get converted into monoatomic gas. What is the change in the total kinetic energy of the gas ?

- (1) $\frac{1}{2} nRT$ (2) 0 (3) $\frac{3}{2} nRT$ (4) $\frac{5}{2} nRT$

Q.11 एक द्विपरमाणुक गैस के N मोल T तापमान पर एक सिलिण्डर में बंद हैं। सिलिण्डर में ऊष्मा इस प्रकार प्रवाहित की जाती है जिससे उस द्विपरमाणुक गैस के n मोल एक परमाणुक गैस में बिना तापमान बदले परिवर्तित हो जाते हैं। गैस की कुल गतिज ऊर्जा में कितना परिवर्तन होगा ?

- (1) $\frac{1}{2} nRT$ (2) 0 (3) $\frac{3}{2} nRT$ (4) $\frac{5}{2} nRT$

Q.12 A block of mass 0.1 kg is connected to an elastic spring of spring constant 640 Nm^{-1} and oscillates in a damping medium of damping constant $10^{-2} \text{ kg s}^{-1}$. The system dissipates its energy gradually. The time taken for its mechanical energy of vibration to drop to half of its initial value, is closest to :

- (1) 2s (2) 3.5s (3) 5s (4) 7s

Q.12 0.1 kg द्रव्यमान के एक गुटके को एक प्रत्यास्थ स्प्रिंग जिसका स्प्रिंग नियतांक 640 Nm^{-1} है, से जोड़ा गया है। यह गुटका एक अवमन्दन माध्यम, जिसका अवमन्दन गुणांक $10^{-2} \text{ kg s}^{-1}$ है, में दोलन गति करता है। यह निकाय धीरे-धीरे अपनी ऊर्जा अपव्यतित करता है। निकाय के दोलन की यांत्रिक ऊर्जा को उसके आरम्भिक मान से आधा होने में लगने वाले समय का निकटतम मान होगा :

- (1) 2s (2) 3.5s (3) 5s (4) 7s

Q.13 A standing wave is formed by the superposition of two waves travelling in opposite directions. The transverse displacement is given by

$$y(x, t) = 0.5 \sin \left(\frac{5\pi}{4} x \right) \cos (200 \pi t).$$

What is the speed of the travelling wave moving in the positive x direction ? (x and t are in meter and second, respectively.)

- (1) 160 m/s (2) 90 m/s (3) 180 m/s (4) 120 m/s

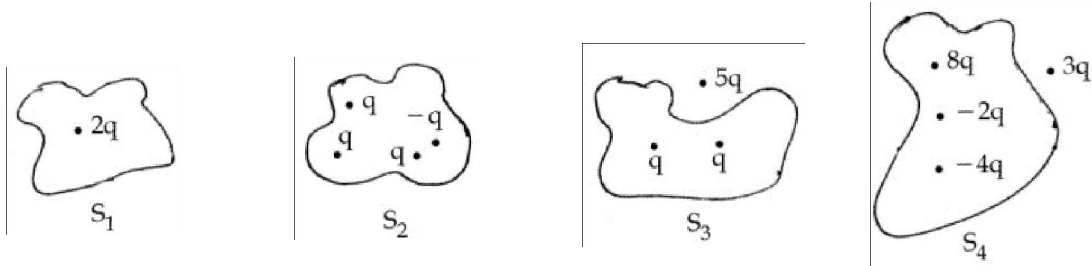
Q.13 दो तरंगें जो विपरीत दिशा में चल रही हैं, के अध्यारोपण से एक अप्रगामी तरंग बनती है जिसका अनुप्रस्थ विस्थापन निम्न समीकरण द्वारा लिखा जा सकता है

$$y(x, t) = 0.5 \sin \left(\frac{5\pi}{4} x \right) \cos (200 \pi t).$$

+x अक्ष की तरफ चलने वाली प्रगामी तरंग की गति होगी ? (यहाँ x व t क्रमशः मीटर व सेकण्ड में हैं।)

- (1) 160 m/s (2) 90 m/s (3) 180 m/s (4) 120 m/s

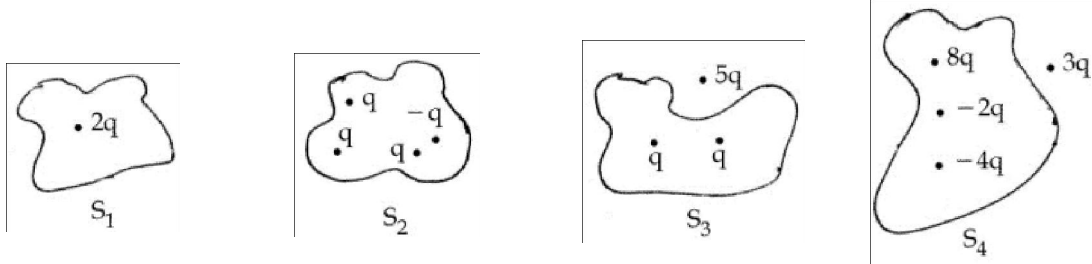
Q.14 Four closed surfaces and corresponding charge distributions are shown below.



Let the respective electric fluxes through the surfaces be Φ_1 , Φ_2 , Φ_3 and Φ_4 . Then :

- (1) $\Phi_1 < \Phi_2 = \Phi_3 > \Phi_4$ (2) $\Phi_1 > \Phi_2 > \Phi_3 > \Phi_4$
 (3) $\Phi_1 = \Phi_2 = \Phi_3 = \Phi_4$ (4) $\Phi_1 > \Phi_3 ; \Phi_2 < \Phi_4$

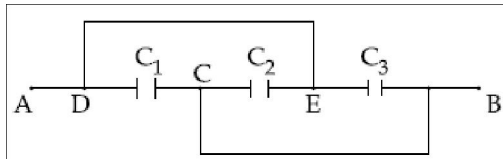
Q.14 चार बंद पृष्ठ तथा उनके आवेश विन्यास को निम्न चित्र में दर्शाया गया है।



यदि उनके पृष्ठ से बद्ध वैद्युत फ्लक्स क्रमशः Φ_1 , Φ_2 , Φ_3 तथा Φ_4 हों तो :

- (1) $\Phi_1 < \Phi_2 = \Phi_3 > \Phi_4$ (2) $\Phi_1 > \Phi_2 > \Phi_3 > \Phi_4$
 (3) $\Phi_1 = \Phi_2 = \Phi_3 = \Phi_4$ (4) $\Phi_1 > \Phi_3 ; \Phi_2 < \Phi_4$

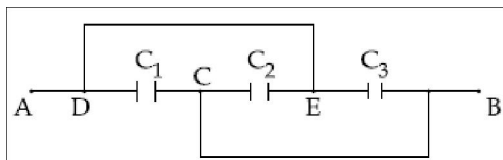
Q.15 A combination of parallel plate capacitors is maintained at a certain potential difference.



When a 3 mm thick slab is introduced between all the plates, in order to maintain the same potential difference, the distance between the plates is increased by 2.4 mm. Find the dielectric constant of the slab.

- (1) 3 (2) 4 (3) 5 (4) 6

Q.15 समान्तर प्लेट संधारित्रों के एक संयोजन को एक निश्चित विभवान्तर पर रखा गया है। (चित्र देखिये)



जब 3 mm मोटे गुटके को सभी संधारित्रों की प्लेटों के बीच डाला जाता है, तो वही विभवान्तर बनाये रखने के लिए प्लेटों के बीच की दूरी को 2.4 mm से बढ़ाना पड़ता है। गुटके का परावैद्युतांक होगा :

- (1) 3 (2) 4 (3) 5 (4) 6

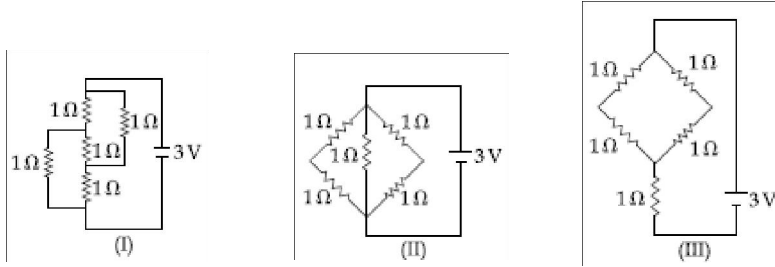
Q.16 A uniform wire of length l and radius r has a resistance of 100Ω . It is recast into a wire of radius $\frac{r}{2}$. The resistance of new wire will be :

- (1) 1600Ω (2) 400Ω (3) 200Ω (4) 100Ω

Q.16 लम्बाई l तथा त्रिज्या r के एकसमान तार का प्रतिरोध 100Ω है। इसको त्रिज्या $\frac{r}{2}$ के तार में पुनः ढाला जाता है। नये तार का प्रतिरोध होगा :

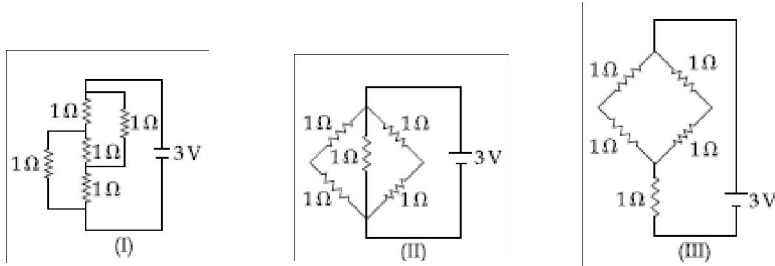
- (1) 1600Ω (2) 400Ω (3) 200Ω (4) 100Ω

Q.17 The figure shows three circuits I, II and III which are connected to a $3V$ battery. If the powers dissipated by the configurations I, II and III are P_1, P_2 and P_3 respectively, then :



- (1) $P_1 > P_2 > P_3$ (2) $P_1 > P_3 > P_2$ (3) $P_2 > P_1 > P_3$ (4) $P_3 > P_2 > P_1$

Q.17 दिये गये चित्र में तीन परिपथ, I, II एवं III को एक $3V$ बैटरी से जोड़ा गया है। यदि विन्यास I, II तथा III क्रमशः P_1, P_2 तथा P_3 शक्ति अपव्यय करते हैं तो :



- (1) $P_1 > P_2 > P_3$ (2) $P_1 > P_3 > P_2$ (3) $P_2 > P_1 > P_3$ (4) $P_3 > P_2 > P_1$

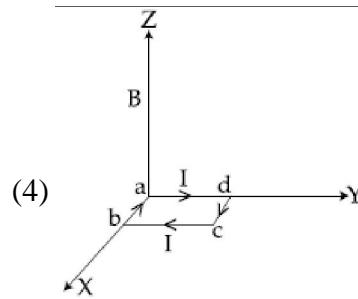
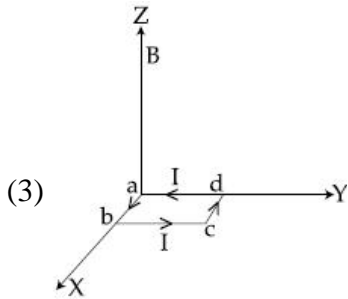
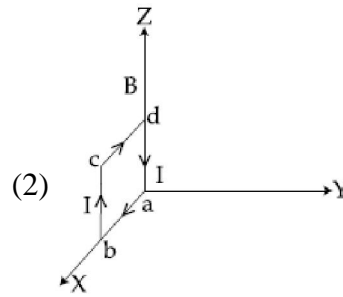
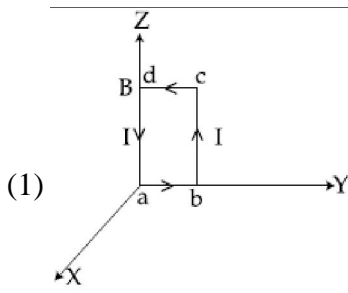
Q.18 A negative test charge is moving near a long straight wire carrying a current. The force acting on the test charge is parallel to the direction of the current. The motion of the charge is :

- (1) away from the wire
 (2) towards the wire
 (3) parallel to the wire along the current
 (4) parallel to the wire opposite to the current

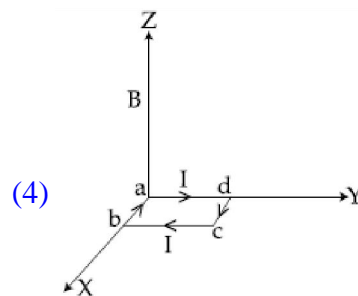
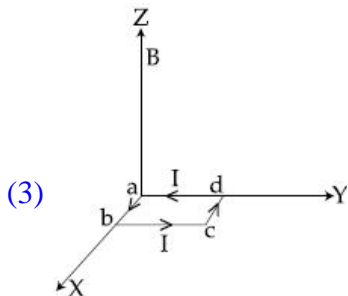
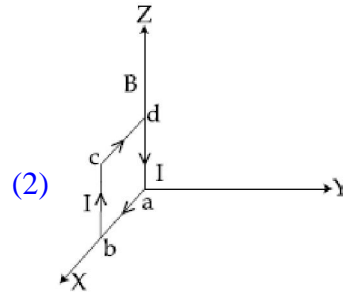
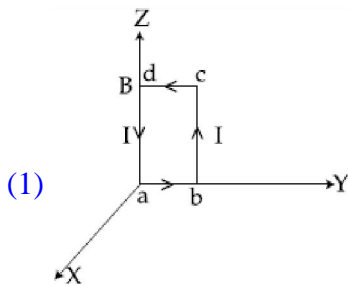
Q.18 एक ऋणात्मक परीक्षण आवेश, एक सीधे लम्बे तार, जिसमें धारा बह रही है, के निकट चल रहा है। परीक्षण आवेश पर लगने वाला बल धारा की दिशा के समान्तर है। आवेश की गति होगी :

- (1) तार से दूर
 (2) तार की ओर
 (3) तार से समान्तर एवं धारा की दिशा में
 (4) तार के समान्तर एवं धारा की विपरीत दिशा में

Q.19 A uniform magnetic field B of 0.3 T is along the positive Z -direction. A rectangular loop ($abcd$) of sides $10\text{ cm} \times 5\text{ cm}$ carries a current I of 12 A . Out of the following different orientations which one corresponds to stable equilibrium ?



Q.19 0.3 T का एक समान चुम्बकीय क्षेत्र B धनात्मक Z -अक्ष की तरफ दिशित है। एक 10 cm तथा 5 cm भुजाओं वाले आयताकार पाश ($abcd$) में 12 A धारा I बहती है। निम्न में से कौन-सा दिग्विन्यास स्थिर साम्यावस्था को प्रदर्शित करता है ?



Q.20 A sinusoidal voltage of peak value 283 V and angular frequency 320s^{-1} is applied to a series LCR circuit. Given that $R = 5\ \Omega$, $L = 25\ \text{mH}$ and $C = 1000\ \mu\text{F}$. The total impedance, and phase difference between the voltage across the source and the current will respectively be :

- (1) $10\ \Omega$ and $\tan^{-1}\left(\frac{5}{3}\right)$ (2) $7\ \Omega$ and 45° (3) $10\ \Omega$ and $\tan^{-1}\left(\frac{8}{3}\right)$ (4) $7\ \Omega$ and $\tan^{-1}\left(\frac{5}{3}\right)$

Q.20 283 V महत्तम विभव तथा 320s^{-1} कोणीय आवृत्ति वाले एक ज्यावक्रीय विभव को एक श्रेणी LCR परिपथ में लगाया गया है। दिया है $R = 5\ \Omega$, $L = 25\ \text{mH}$ और $C = 1000\ \mu\text{F}$ । परिपथ की कुल प्रतिबाधा तथा स्रोत विभव एवं धारा के बीच कलांतर क्रमशः होगा :

- (1) $10\ \Omega$ और $\tan^{-1}\left(\frac{5}{3}\right)$ (2) $7\ \Omega$ और 45° (3) $10\ \Omega$ और $\tan^{-1}\left(\frac{8}{3}\right)$ (4) $7\ \Omega$ और $\tan^{-1}\left(\frac{5}{3}\right)$

Q.21 The electric field component of a monochromatic radiation is given by

$$\vec{E} = 2E_0 \hat{i} \cos kz \cos \omega t$$

Its magnetic field \vec{B} is then given by :

- (1) $\frac{2E_0}{c} \hat{j} \sin kz \cos \omega t$ (2) $-\frac{2E_0}{c} \hat{j} \sin kz \sin \omega t$
 (3) $\frac{2E_0}{c} \hat{j} \sin kz \sin \omega t$ (4) $\frac{2E_0}{c} \hat{j} \cos kz \cos \omega t$

Q.21 किसी एकवर्णीय विकिरण के वैद्युत क्षेत्र घटक को निम्न प्रकार से व्यक्त किया जा सकता है

$$\vec{E} = 2E_0 \hat{i} \cos kz \cos \omega t$$

उसके चुम्बकीय क्षेत्र \vec{B} का मान होगा :

- (1) $\frac{2E_0}{c} \hat{j} \sin kz \cos \omega t$ (2) $-\frac{2E_0}{c} \hat{j} \sin kz \sin \omega t$
 (3) $\frac{2E_0}{c} \hat{j} \sin kz \sin \omega t$ (4) $\frac{2E_0}{c} \hat{j} \cos kz \cos \omega t$

Q.22 In an experiment a convex lens of focal length 15 cm is placed coaxially on an optical bench in front of a convex mirror at a distance of 5 cm from it. It is found that an object and its image coincide, if the object is placed at a distance of 20 cm from the lens. The focal length of the convex mirror is :

- (1) 27.5 cm (2) 20.0 cm (3) 25.0 cm (4) 30.5 cm

Q.22 एक प्रयोग के दौरान, 15 cm फोकस दूरी के एक उत्तल लेंस को एक प्रकाश बेंच पर एक उत्तल दर्पण के सामने 5 cm दूरी पर समाक्षीय स्थिति में रखा गया है। यदि वस्तु को लेंस से 20 cm की दूरी पर रखा जाये तो वस्तु तथा उसका प्रतिबिम्ब संपाती हो जाते हैं। उत्तल दर्पण की फोकस दूरी होगी :

- (1) 27.5 cm (2) 20.0 cm (3) 25.0 cm (4) 30.5 cm

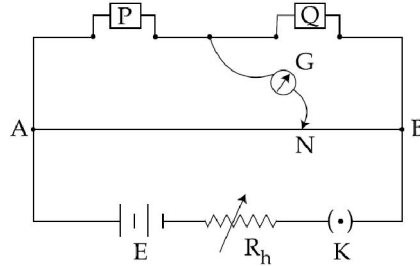
Q.23 A single slit of width 0.1 mm is illuminated by a parallel beam of light of wavelength $6000\ \text{\AA}$ and diffraction bands are observed on a screen 0.5 m from the slit. The distance of the third dark band from the central bright band is :

- (1) 3 mm (2) 9 mm (3) 4.5 mm (4) 1.5 mm

- Q.23 0.1 mm चौड़ाई की एक झिरी 6000 Å तरंगदैर्घ्य के समान्तर किरण पुंज से प्रकाशित की जाती है और विवर्तन बैंड को झिरी से 0.5 m दूर स्थित पर्दे पर देखा जाता है। तृतीय अदीप्त बैंड की केन्द्रीय दीप्त बैंड से दूरी होगी :
 (1) 3 mm (2) 9 mm (3) 4.5 mm (4) 1.5 mm
- Q.24 A Laser light of wavelength 660 nm is used to weld Retina detachment. If a Laser pulse of width 60 ms and power 0.5 kW is used the approximate number of photons in the pulse are :
 [Take Planck's constant $h=6.62 \times 10^{-34}$ Js]
 (1) 10^{20} (2) 10^{18} (3) 10^{22} (4) 10^{19}
- Q.24 660 nm तरंगदैर्घ्य की एक लेजर लाइट को रेटिना वियोजन को जोड़ने के लिए प्रयोग किया जाता है। यदि 60 ms चौड़ाई एवं 0.5 kW शक्ति के लेजर स्पन्द (pulse) का प्रयोग किया जाये तो उस स्पन्द में फोटॉनों की संख्या लगभग होगी :
 [प्लांक नियतांक $h=6.62 \times 10^{-34}$ Js]
 (1) 10^{20} (2) 10^{18} (3) 10^{22} (4) 10^{19}
- Q.25 The acceleration of an electron in the first orbit of the hydrogen atom ($n=1$) is :
 (1) $\frac{h^2}{\pi^2 m^2 r^3}$ (2) $\frac{h^2}{8\pi^2 m^2 r^3}$ (3) $\frac{h^2}{4\pi^2 m^2 r^3}$ (4) $\frac{h^2}{4\pi m^2 r^3}$
- Q.25 हाइड्रोजन परमाणु की प्रथम कक्षा ($n=1$) के इलेक्ट्रॉन का त्वरण होगा :
 (1) $\frac{h^2}{\pi^2 m^2 r^3}$ (2) $\frac{h^2}{8\pi^2 m^2 r^3}$ (3) $\frac{h^2}{4\pi^2 m^2 r^3}$ (4) $\frac{h^2}{4\pi m^2 r^3}$
- Q.26 Imagine that a reactor converts all given mass into energy and that it operates at a power level of 10^9 watt. The mass of the fuel consumed per hour in the reactor will be : (velocity of light, $c = 3 \times 10^8$ m/s)
 (1) 0.96 gm (2) 0.8 gm (3) 4×10^{-2} gm (4) 6.6×10^{-5} gm
- Q.26 कल्पना कीजिए, एक भट्ठी, जोकि दिये गये संपूर्ण द्रव्यमान को ऊर्जा में बदलती है एवं 10^9 watt की शक्ति स्तर पर चलती है। भट्ठी में एक घण्टे में खपत होने वाले ईंधन का द्रव्यमान होगा : (प्रकाश का वेग, $c = 3 \times 10^8$ m/s)
 (1) 0.96 gm (2) 0.8 gm (3) 4×10^{-2} gm (4) 6.6×10^{-5} gm
- Q.27 The current gain of a common emitter amplifier is 69. If the emitter current is 7.0 mA, collector current is:
 (1) 9.6 mA (2) 6.9 mA (3) 0.69 mA (4) 69 mA
- Q.27 एक उभयनिष्ठ उत्सर्जक प्रवर्धक का धारा लाभ 69 है। यदि उत्सर्जक धारा का मान 7.0 mA हो तो संग्राहक धारा का मान होगा:
 (1) 9.6 mA (2) 6.9 mA (3) 0.69 mA (4) 69 mA
- Q.28 A signal is to be transmitted through a wave of wavelength λ , using a linear antenna. The length l of the antenna and effective power radiated P_{eff} will be given respectively as : (K is a constant of proportionality)
 (1) λ , $P_{\text{eff}} = K \left(\frac{l}{\lambda}\right)^2$ (2) $\frac{\lambda}{8}$, $P_{\text{eff}} = K \left(\frac{l}{\lambda}\right)$ (3) $\frac{\lambda}{16}$, $P_{\text{eff}} = K \left(\frac{l}{\lambda}\right)^3$ (4) $\frac{\lambda}{5}$, $P_{\text{eff}} = K \left(\frac{l}{\lambda}\right)^{\frac{1}{2}}$
- Q.28 तरंगदैर्घ्य λ की तरंग द्वारा एक संदेश को एक एकरेखीय एन्टेना से प्रसारित करना है। एन्टेना की लम्बाई l तथा प्रभावी उत्सर्जित शक्ति P_{eff} का क्रमशः मान होगा : (K समानुपातिक स्थिरांक (constant of proportionality) है)

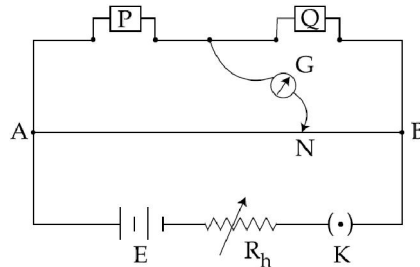
$$(1) \lambda, P_{\text{eff}} = K \left(\frac{l}{\lambda} \right)^2 \quad (2) \frac{\lambda}{8}, P_{\text{eff}} = K \left(\frac{l}{\lambda} \right) \quad (3) \frac{\lambda}{16}, P_{\text{eff}} = K \left(\frac{l}{\lambda} \right)^3 \quad (4) \frac{\lambda}{5}, P_{\text{eff}} = K \left(\frac{l}{\lambda} \right)^{\frac{1}{2}}$$

- Q.29 In a meter bridge experiment resistances are connected as shown in the figure. Initially resistance $P=4\ \Omega$ and the neutral point N is at 60 cm from A . Now an unknown resistance R is connected in series to P and the new position of the neutral point is at 80 cm from A . The value of unknown resistance R is :



- (1) $\frac{33}{5}\ \Omega$ (2) $6\ \Omega$ (3) $7\ \Omega$ (4) $\frac{20}{3}\ \Omega$

- Q.29 किसी मीटर सेतु प्रयोग के दौरान, प्रतिरोधों को चित्रानुसार जोड़ा गया है। शुरू में प्रतिरोध $P=4\ \Omega$ तथा नल बिन्दु N , बिन्दु A से, 60 cm की दूरी पर है। एक अज्ञात प्रतिरोध R को P के साथ श्रेणीक्रम में जोड़ा जाता है जिससे नल बिन्दु की नई स्थिति बिंदु A से 80 cm दूर हो जाती है। अज्ञात प्रतिरोध R का मान होगा :



- (1) $\frac{33}{5}\ \Omega$ (2) $6\ \Omega$ (3) $7\ \Omega$ (4) $\frac{20}{3}\ \Omega$

- Q.30 In an experiment to determine the period of a simple pendulum of length 1 m, it is attached to different spherical bobs of radii r_1 and r_2 . The two spherical bobs have uniform mass distribution. If the relative difference in the periods, is found to be 5×10^{-4} s, the difference in radii $|r_1 - r_2|$ is best given by :

- (1) 1 cm (2) 0.1 cm (3) 0.5 cm (4) 0.01 cm

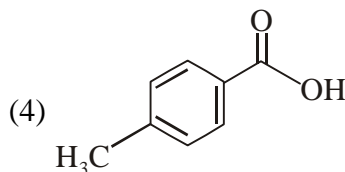
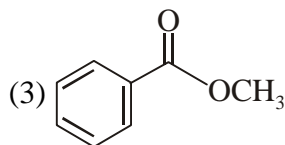
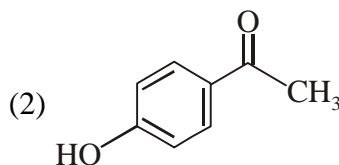
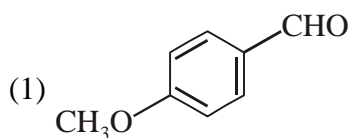
- Q.30 एक प्रयोग में, 1 m लम्बाई की एक सरल दोलक का आवर्त काल निकालने हेतु उसको r_1 तथा r_2 त्रिज्याओं के अलग-अलग गोलाकार लोलक से जोड़ा जाता है। दोनों गोलाकार लोलकों के द्रव्यमान वितरण एक समान हैं। यदि आवर्तकालों का सापेक्ष अंतर 5×10^{-4} s पाया गया हो तो उनकी त्रिज्याओं में अन्तर, $|r_1 - r_2|$ का निकटतम मान होगा:

- (1) 1 cm (2) 0.1 cm (3) 0.5 cm (4) 0.01 cm

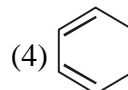
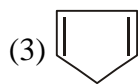
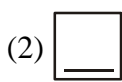
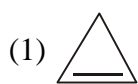
- Q.1 An ideal gas undergoes isothermal expansion at constant pressure. During the process :
- (1) enthalpy increases but entropy decreases.
 - (2) enthalpy remains constant but entropy increases.
 - (3) enthalpy decreases but entropy increases.
 - (4) Both enthalpy and entropy remain constant.
- Q.2 50 mL of 0.2 M ammonia solution is treated with 25 mL of 0.2 M HCl. If pK_b of ammonia solution is 4.75, the pH of the mixture will be :
- (1) 3.75
 - (2) 4.75
 - (3) 8.25
 - (4) 9.25
- Q.3 The electron in the hydrogen atom undergoes transition from higher orbitals to orbital of radius 211.6 pm. This transition is associated with :
- (1) Lyman series
 - (2) Balmer series
 - (3) Paschen series
 - (4) Brackett series
- Q.4 At 300 K, the density of a certain gaseous molecule at 2 bar is double to that of dinitrogen (N_2) at 4 bar. The molar mass of gaseous molecule is :
- (1) 28 g mol⁻¹
 - (2) 56 g mol⁻¹
 - (3) 112 g mol⁻¹
 - (4) 224 g mol⁻¹
- Q.5 What quantity (in mL) of a 45% acid solution of a mono-protic strong acid must be mixed with a 20% solution of the same acid to produce 800 mL of a 29.875 % acid solution ?
- (1) 320
 - (2) 325
 - (3) 316
 - (4) 330
- Q.6 To find the standard potential of M^{3+}/M electrode, the following cell is constituted :
- $$Pt / M / M^{3+}(0.001 \text{ mol L}^{-1}) / Ag^+(0.01 \text{ mol L}^{-1}) / Ag$$
- The emf of the cell is found to be 0.421 volt at 298 K. The standard potential of half reaction $M^{3+} + 3e^- \rightarrow M$ at 298 K will be :
- [Given : $E_{Ag^+/Ag}^\ominus$ at 298 K = 0.80 Volt]
- (1) 0.38 Volt
 - (2) 0.32 Volt
 - (3) 1.28 Volt
 - (4) 0.66 Volt
- Q.7 A gas undergoes change from state A to state B. In this process, the heat absorbed and work done by the gas is 5 J and 8 J, respectively. Now gas is brought back to A by another process during which 3 J of heat is evolved. In this reverse process of B to A :
- (1) 10 J of the work will be done by the gas.
 - (2) 6 J of the work will be done by the gas.
 - (3) 10 J of the work will be done by the surrounding on gas.
 - (4) 6 J of the work will be done by the surrounding on gas.

- Q.8 Adsorption of a gas on a surface follows Freundlich adsorption isotherm. Plot of $\log \frac{x}{m}$ versus $\log p$ gives a straight line with slope equal to 0.5, then :
- ($\frac{x}{m}$ is the mass of the gas adsorbed per gram of adsorbent)
- (1) Adsorption is independent of pressure.
 - (2) Adsorption is proportional to the pressure.
 - (3) Adsorption is proportional to the square root of pressure.
 - (4) Adsorption is proportional to the square of pressure.
- Q.9 The rate of a reaction quadruples when the temperature changes from 300 to 310 K. The activation energy of this reaction is :
- (Assume activation energy and preexponential factor are independent of temperature; $\ln 2=0.693$; $R=8.314 \text{ J mol}^{-1} \text{ K}^{-1}$)
- (1) $107.2 \text{ kJ mol}^{-1}$
 - (2) 53.6 kJ mol^{-1}
 - (3) 26.8 kJ mol^{-1}
 - (4) $214.4 \text{ kJ mol}^{-1}$
- Q.10 A solution is prepared by mixing 8.5 g of CH_2Cl_2 and 11.95 g of CHCl_3 . If vapour pressure of CH_2Cl_2 and CHCl_3 at 298 K are 415 and 200 mmHg respectively, the mole fraction of CHCl_3 in vapour form is : (Molar mass of Cl= 35.5 g mol^{-1})
- (1) 0.162
 - (2) 0.675
 - (3) 0.325
 - (4) 0.486
- Q.11 The electronic configuration with the highest ionization enthalpy is :
- (1) $[\text{Ne}] 3s^2 3p^1$
 - (2) $[\text{Ne}] 3s^2 3p^2$
 - (3) $[\text{Ne}] 3s^2 3p^3$
 - (4) $[\text{Ar}] 3d^{10} 4s^2 4p^3$
- Q.12 The following reaction occurs in the Blast Furnace where iron ore is reduced to iron metal :
- $$\text{Fe}_2\text{O}_3(\text{s}) + 3 \text{CO}(\text{g}) \rightleftharpoons 2 \text{Fe}(\text{l}) + 3 \text{CO}_2(\text{g})$$
- Using the Le Chatelier's principle, predict which one of the following will not disturb the equilibrium ?
- (1) Removal of CO
 - (2) Removal of CO_2
 - (3) Addition of CO_2
 - (4) Addition of Fe_2O_3
- Q.13 Which one of the following is an oxide ?
- (1) KO_2
 - (2) BaO_2
 - (3) SiO_2
 - (4) CsO_2
- Q.14 Which of the following is a set of green house gases ?
- (1) $\text{CH}_4, \text{O}_3, \text{N}_2, \text{SO}_2$
 - (2) $\text{O}_3, \text{N}_2, \text{CO}_2, \text{NO}_2$
 - (3) $\text{O}_3, \text{NO}_2, \text{SO}_2, \text{Cl}_2$
 - (4) $\text{CO}_2, \text{CH}_4, \text{N}_2\text{O}, \text{O}_3$
- Q.15 The group having triangular planar structures is :
- (1) $\text{BF}_3, \text{NF}_3, \text{CO}_3^{2-}$
 - (2) $\text{CO}_3^{2-}, \text{NO}_3^-, \text{SO}_3$
 - (3) $\text{NH}_3, \text{SO}_3, \text{CO}_3^{2-}$
 - (4) $\text{NCl}_3, \text{BCl}_3, \text{SO}_3$
- Q.16 XeF_6 on partial hydrolysis with water produces a compound 'X'. The same compound 'X' is formed when XeF_6 reacts with silica. The compound 'X' is :
- (1) XeF_2
 - (2) XeF_4
 - (3) XeOF_4
 - (4) XeO_3

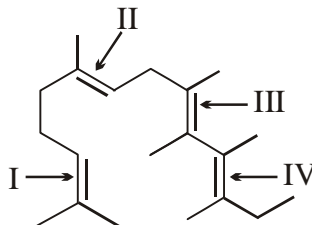
- Q.17 The number of P – OH bonds and the oxidation state of phosphorus atom in pyrophosphoric acid ($H_4P_2O_7$) respectively are :
 (1) four and four (2) five and four (3) five and five (4) four and five
- Q.18 Which of the following ions does not liberate hydrogen gas on reaction with dilute acids ?
 (1) Ti^{2+} (2) V^{2+} (3) Cr^{2+} (4) Mn^{2+}
- Q.19 The correct sequence of decreasing number of π -bonds in the structures of H_2SO_3 , H_2SO_4 and $H_2S_2O_7$ is:
 (1) $H_2SO_3 > H_2SO_4 > H_2S_2O_7$ (2) $H_2SO_4 > H_2S_2O_7 > H_2SO_3$
 (3) $H_2S_2O_7 > H_2SO_4 > H_2SO_3$ (4) $H_2S_2O_7 > H_2SO_3 > H_2SO_4$
- Q.20 $[Co_2(CO)_8]$ displays :
 (1) one Co-Co bond, six terminal CO and two bridging CO
 (2) one Co-Co bond, four terminal CO and four bridging CO
 (3) no Co-Co bond, six terminal CO and two bridging CO
 (4) no Co-Co bond, four terminal CO and four bridging CO
- Q.21 A compound of molecular formula $C_8H_8O_2$ reacts with acetophenone to form a single cross-aldol product in the presence of base. The same compound on reaction with conc. NaOH forms benzyl alcohol as one of the products. The structure of the compound is :



- Q.22 Which of the following compounds is most reactive to an aqueous solution of sodium carbonate ?



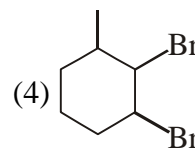
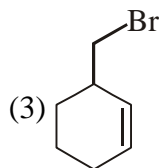
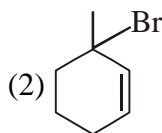
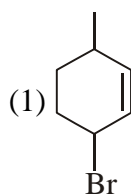
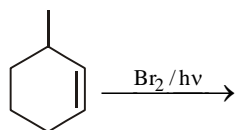
- Q.23 In the following structure, the double bonds are marked as I, II, III and IV



Geometrical isomerism is not possible at site (s) :

- (1) III (2) I (3) I and III (4) III and IV

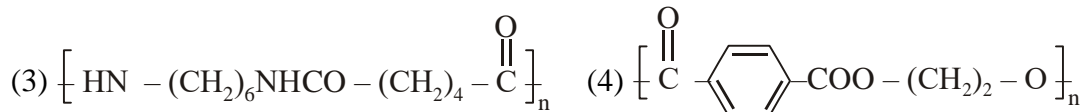
Q.24 The major product of the following reaction is :



Q.25 The incorrect statement among the following is :

- (1) α -D-glucose and β -D-glucose are anomers.
- (2) α -D-glucose and β -D-glucose are enantiomers.
- (3) Cellulose is a straight chain polysaccharide made up of only β -D-glucose units.
- (4) The penta acetate of glucose does not react with hydroxyl amine.

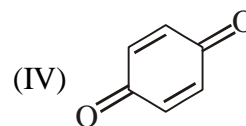
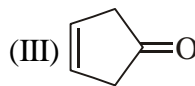
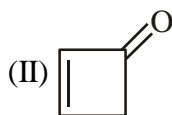
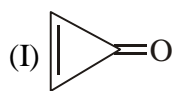
Q.26 Which of the following is a biodegradable polymer ?



Q.27 The increasing order of the boiling points for the following compounds is :

- (I) $\text{C}_2\text{H}_5\text{OH}$ (II) $\text{C}_2\text{H}_5\text{Cl}$ (III) $\text{C}_2\text{H}_5\text{CH}_3$ (IV) $\text{C}_2\text{H}_5\text{OCH}_3$
- (1) (III) < (IV) < (II) < (I)
 - (2) (IV) < (III) < (I) < (II)
 - (3) (II) < (III) < (IV) < (I)
 - (4) (III) < (II) < (I) < (IV)

Q.28 Which of the following compounds will show highest dipole moment ?



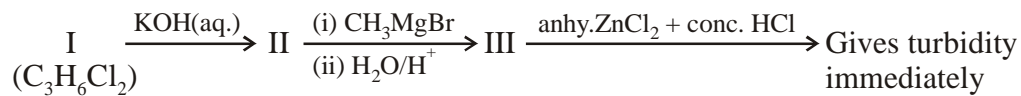
(1) (I)

(2) (II)

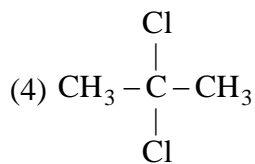
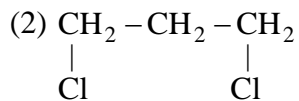
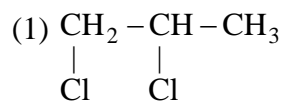
(3) (III)

(4) (IV)

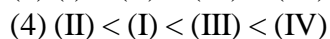
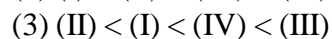
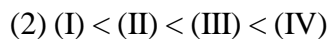
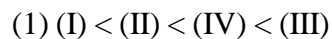
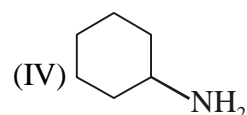
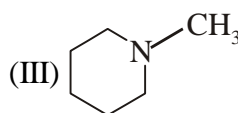
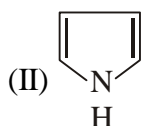
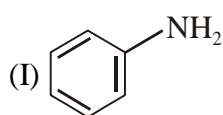
Q.29 In the following reaction sequence :

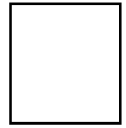


The compound I is :



Q.30 Among the following compounds, the increasing order of their basic strength is :





- Q.1 The function $f : \mathbb{N} \rightarrow \mathbb{N}$ defined by $f(x) = x - 5 \left\lfloor \frac{x}{5} \right\rfloor$, where \mathbb{N} is the set of natural numbers and $\lfloor x \rfloor$ denotes the greatest integer less than or equal to x , is
 (1) one-one and onto. (2) one-one but not onto.
 (3) onto but not one-one. (4*) neither one-one nor onto.
- Q.2 The sum of all the real values of x satisfying the equation $2^{(x-1)(x^2+5x-50)} = 1$ is
 (1) 16 (2) 14 (3*) -4 (4) -5
- Q.3 The equation $\text{Im} \left(\frac{iz-2}{z-i} \right) + 1 = 0$, $z \in \mathbb{C}$, $z \neq i$ represents a part of a circle having radius equal to
 (1) 2 (2) 1 (3*) $\frac{3}{4}$ (4) $\frac{1}{2}$
- Q.4 For two 3×3 matrices A and B , let $A + B = 2B'$ and $3A + 2B = I_3$, where B' is the transpose of B and I_3 is 3×3 identity matrix. Then
 (1) $5A + 10B = 2I_3$ (2*) $10A + 5B = 3I_3$ (3) $B + 2A = I_3$ (4) $3A + 6B = 2I_3$
- Q.5 If $x = a$, $y = b$, $z = c$ is a solution of the system of linear equations
 $x + 8y + 7z = 0$
 $9x + 2y + 3z = 0$
 $x + y + z = 0$
 such that the point (a, b, c) lies on the plane $x + 2y + z = 6$, then $2a + b + c$ equals
 (1) -1 (2) 0 (3*) 1 (4) 2
- Q.6 The number of ways in which 5 boys and 3 girls can be seated on a round table if a particular boy B_1 and a particular girl G_1 never sit adjacent to each other, is
 (1*) $5 \times 6!$ (2) $6 \times 6!$ (3) $7!$ (4) $5 \times 7!$
- Q.7 The coefficient of x^{-5} in the binomial expansion of $\left(\frac{x+1}{x^{2/3} - x^{1/3} + 1} - \frac{x-1}{x - x^{1/2}} \right)^{10}$, where $x \neq 0, 1$, is
 (1*) 1 (2) 4 (3) -4 (4) -1
- Q.8 If three positive numbers a, b and c are in A.P. such that $abc = 8$, then the minimum possible value of b is
 (1*) 2 (2) $4^{1/3}$ (3) $4^{2/3}$ (4) 4

- Q.9 Let $S_n = \frac{1}{1^3} + \frac{1+2}{1^3+2^3} + \frac{1+2+3}{1^3+2^3+3^3} + \dots + \frac{1+2+\dots+n}{1^3+2^3+\dots+n^3}$. If $100 S_n = n$, then n is equal to
 (1*) 199 (2) 99 (3) 200 (4) 19

- Q.10 The value of k for which the function $f(x) = \begin{cases} \left(\frac{4}{5}\right)^{\frac{\tan 4x}{\tan 5x}}, & 0 < x < \frac{\pi}{2} \\ k + \frac{2}{5}, & x = \frac{\pi}{2} \end{cases}$ is continuous at $x = \frac{\pi}{2}$, is
 (1) $\frac{17}{20}$ (2) $\frac{2}{5}$ (3*) $\frac{3}{5}$ (4) $-\frac{2}{5}$

- Q.11 If $2x = y^{\frac{1}{5}} + y^{-\frac{1}{5}}$ and $(x^2 - 1)\frac{d^2y}{dx^2} + \lambda x \frac{dy}{dx} + ky = 0$, then $\lambda + k$ is equal to
 (1) -23 (2*) -24 (3) 26 (4) -26

- Q.12 The function f defined by $f(x) = x^3 - 3x^2 + 5x + 7$, is
 (1*) increasing in \mathbb{R}
 (2) decreasing in \mathbb{R}
 (3) decreasing in $(0, \infty)$ and increasing in $(-\infty, 0)$
 (4) increasing in $(0, \infty)$ and decreasing in $(-\infty, 0)$

- Q.13 Let f be a polynomial function such that $f(3x) = f'(x) \cdot f''(x)$, for all $x \in \mathbb{R}$. Then
 (1) $f(2) + f'(2) = 28$ (2*) $f''(2) - f'(2) = 0$ (3) $f''(2) - f(2) = 4$ (4) $f(2) - f'(2) + f''(2) = 10$

- Q.14 If $f\left(\frac{3x-4}{3x+4}\right) = x + 2$, $x \neq \frac{-4}{3}$, and $\int f(x) dx = A \log |1-x| + Bx + C$, then the ordered pair (A, B) is equal to (where C is a constant of integration)
 (1) $\left(\frac{8}{3}, \frac{2}{3}\right)$ (2*) $\left(\frac{-8}{3}, \frac{2}{3}\right)$ (3) $\left(\frac{-8}{3}, \frac{-2}{3}\right)$ (4) $\left(\frac{8}{3}, \frac{-2}{3}\right)$

- Q.15 If $\int_1^2 \frac{dx}{(x^2 - 2x + 4)^{3/2}} = \frac{k}{k+5}$, then k is equal to
 (1*) 1 (2) 2 (3) 3 (4) 4

Q.16 If $\lim_{n \rightarrow \infty} \frac{1^a + 2^a + \dots + n^a}{(n+1)^{a-1} [(na+1) + (na+2) + \dots + (na+n)]} = \frac{1}{60}$ for some positive real number a, then a is equal to

- (1*) 7 (2) 8 (3) $\frac{15}{2}$ (4) $\frac{17}{2}$

Q.17 A tangent to the curve, $y = f(x)$ at $P(x, y)$ meets x-axis at A and y-axis at B. If $AP : BP = 1 : 3$ and $f(1) = 1$, then the curve also passes through the point

- (1) $\left(\frac{1}{3}, 24\right)$ (2) $\left(\frac{1}{2}, 4\right)$ (3*) $\left(2, \frac{1}{8}\right)$ (4) $\left(3, \frac{1}{28}\right)$

Q.18 A square, of each side 2, lies above the x-axis and has one vertex at the origin. If one of the sides passing through the origin makes an angle 30° with the positive direction of the x-axis, then the sum of the x-coordinates of the vertices of the square is

- (1) $2\sqrt{3} - 1$ (2*) $2\sqrt{3} - 2$ (3) $\sqrt{3} - 2$ (4) $\sqrt{3} - 1$

Q.19 A line drawn through the point $P(4, 7)$ cuts the circle $x^2 + y^2 = 9$ at the points A and B. Then $PA \cdot PB$ is equal to

- (1) 53 (2*) 56 (3) 74 (4) 65

Q.20 The eccentricity of an ellipse having centre at the origin, axes along the co-ordinate axes and passing through the points $(4, -1)$ and $(-2, 2)$ is

- (1) $\frac{1}{2}$ (2) $\frac{2}{\sqrt{5}}$ (3*) $\frac{\sqrt{3}}{2}$ (4) $\frac{\sqrt{3}}{4}$

Q.21 If $y = mx + c$ is the normal at a point on the parabola $y^2 = 8x$ whose focal distance is 8 units, then $|c|$ is equal to

- (1) $2\sqrt{3}$ (2) $8\sqrt{3}$ (3*) $10\sqrt{3}$ (4) $16\sqrt{3}$

Q.22 If a variable plane, at a distance of 3 units from the origin, intersects the coordinate axes at A, B and C, then the locus of the centroid of ΔABC is

- (1*) $\frac{1}{x^2} + \frac{1}{y^2} + \frac{1}{z^2} = 1$ (2) $\frac{1}{x^2} + \frac{1}{y^2} + \frac{1}{z^2} = 3$
 (3) $\frac{1}{x^2} + \frac{1}{y^2} + \frac{1}{z^2} = \frac{1}{9}$ (4) $\frac{1}{x^2} + \frac{1}{y^2} + \frac{1}{z^2} = 9$

- Q.23 If the line $\frac{x-3}{1} = \frac{y+2}{-1} = \frac{z+\lambda}{-2}$ lies in the plane, $2x - 4y + 3z = 2$, then the shortest distance between this line and the line, $\frac{x-1}{12} = \frac{y}{9} = \frac{z}{4}$ is
- (1) 2 (2) 1 (3*) 0 (4) 3
- Q.24 If the vectors $\vec{b} = 3\hat{j} + 4\hat{k}$ is written as the sum of a vector \vec{b}_1 , parallel to $\vec{a} = \hat{i} + \hat{j}$ and a vector \vec{b}_2 , perpendicular to \vec{a} , then $\vec{b}_1 \times \vec{b}_2$ is equal to
- (1) $-3\hat{i} + 3\hat{j} - 9\hat{k}$ (2*) $6\hat{i} + 6\hat{j} + \frac{9}{2}\hat{k}$ (3) $-6\hat{i} + 6\hat{j} - \frac{9}{2}\hat{k}$ (4) $3\hat{i} - 3\hat{j} + 9\hat{k}$
- Q.25 From a group of 10 men and 5 women, four member committees are to be formed each of which must contain at least one woman. Then the probability for these committees to have more women than men, is
- (1) $\frac{21}{220}$ (2) $\frac{3}{11}$ (3*) $\frac{1}{11}$ (4) $\frac{2}{23}$
- Q.26 Let E and F be two independent events. The probability that both E and F happen is $\frac{1}{12}$ and the probability that neither E nor F happens is $\frac{1}{2}$, then a value of $\frac{P(E)}{P(F)}$ is
- (1*) $\frac{4}{3}$ (2) $\frac{3}{2}$ (3) $\frac{1}{3}$ (4) $\frac{5}{12}$
- Q.27 The sum of 100 observations and the sum of their squares are 400 and 2475, respectively. Later on, three observations, 3, 4 and 5, were found to be incorrect. If the incorrect observations are omitted, then the variance of the remaining observations is
- (1) 8.25 (2) 8.50 (3) 8.00 (4*) 9.00
- Q.28 A value of x satisfying the equation $\sin[\cot^{-1}(1+x)] = \cos[\tan^{-1}x]$, is
- (1*) $\frac{-1}{2}$ (2) -1 (3) 0 (4) $\frac{1}{2}$
- Q.29 The two adjacent sides of a cyclic quadrilateral are 2 and 5 and the angle between them is 60° . If the area of the quadrilateral is $4\sqrt{3}$, then the perimeter of the quadrilateral is
- (1) 12.5 (2) 13.2 (3*) 12 (4) 13
- Q.30 Contrapositive of the statement 'If two numbers are not equal, then their squares are not equal', is
- (1*) If the squares of two numbers are equal, then the numbers are equal.
 (2) If the squares of two numbers are equal, then the numbers are not equal.
 (3) If the squares of two numbers are not equal, then the numbers are not equal.
 (4) If the squares of two numbers are not equal, then the numbers are equal.