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Question Paper Name : B TECH 25th Feb 2021 Shift 1
Subject Name : B TECH
Creation Date : 2021-02-24 14:08:00
Duration : 180
Number of Questions : 90
Total Marks : 300
Display Marks: Yes

B TECH

Group Number : 1
Group Id : 708191189
Group Maximum Duration : 0
Group Minimum Duration : 180
Show Attended Group? : No
Edit Attended Group? : No
Break time : 0
Group Marks : 300
Is this Group for Examiner? : No

Physics Section A

Section Id : 708191712
Section Number : 1
Section type : Online

Mandatory or Optional :	Mandatory
Number of Questions :	20
Number of Questions to be attempted :	20
Section Marks :	80
Mark As Answered Required? :	Yes
Sub-Section Number :	1
Sub-Section Id :	708191992
Question Shuffling Allowed :	Yes

Question Number : 1 Question Id : 70819117584 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

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

Assertion A : The escape velocities of planet A and B are same. But A and B are of unequal mass.

Reason R : The product of their mass and radius must be same. $M_1R_1 = M_2R_2$

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

Options :

70819157901. Both A and R are correct and R is the correct explanation of A

70819157902. Both A and R are correct but R is NOT the correct explanation of A

70819157903. A is correct but R is not correct

70819157904. A is not correct but R is correct

Question Number : 2 Question Id : 70819117585 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Match List - I with List - II :

List - I	List - II
(a) h (Planck's constant)	(i) $[M L T^{-1}]$
(b) E (kinetic energy)	(ii) $[M L^2 T^{-1}]$
(c) V (electric potential)	(iii) $[M L^2 T^{-2}]$
(d) P (linear momentum)	(iv) $[M L^2 I^{-1} T^{-3}]$

Choose the correct answer from the options given below :

Options :

70819157905. (a) \rightarrow (i), (b) \rightarrow (ii), (c) \rightarrow (iv), (d) \rightarrow (iii)

70819157906. (a) \rightarrow (iii), (b) \rightarrow (iv), (c) \rightarrow (ii), (d) \rightarrow (i)

70819157907. (a) \rightarrow (ii), (b) \rightarrow (iii), (c) \rightarrow (iv), (d) \rightarrow (i)

70819157908. (a) \rightarrow (iii), (b) \rightarrow (ii), (c) \rightarrow (iv), (d) \rightarrow (i)

Question Number : 3 Question Id : 70819117586 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If the time period of a two meter long simple pendulum is 2 s, the acceleration due to gravity at the place where pendulum is executing S.H.M. is :

Options :

70819157909. 16 m/s^2

70819157910. $\pi^2 \text{ ms}^{-2}$

70819157911. 9.8 ms^{-2}

70819157912. $2\pi^2 \text{ ms}^{-2}$

Question Number : 4 Question Id : 70819117587 Question Type : MCQ Opti

Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

A student is performing the experiment of resonance column. The diameter of the column tube is 6 cm. The frequency of the tuning fork is 504 Hz. Speed of the sound at the given temperature is 336 m/s. The zero of the metre scale coincides with the top end of the resonance column tube. The reading of the water level in the column when the first resonance occurs is:

Options :

70819157913. 16.6 cm

70819157914. 18.4 cm

70819157915. 14.8 cm

70819157916. 13 cm

Question Number : 5 Question Id : 70819117588 Question Type : MCQ Option Shuffling : Yes Is

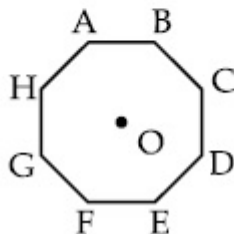
Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

In an octagon ABCDEFGH of equal side, what is the sum of

$$\vec{AB} + \vec{AC} + \vec{AD} + \vec{AE} + \vec{AF} + \vec{AG} + \vec{AH},$$

if, $\vec{AO} = 2\hat{i} + 3\hat{j} - 4\hat{k}$



Options :

70819157917. $16\hat{i} + 24\hat{j} + 32\hat{k}$

70819157918.

$$-16\hat{i} - 24\hat{j} + 32\hat{k}$$

70819157919. $16\hat{i} - 24\hat{j} + 32\hat{k}$

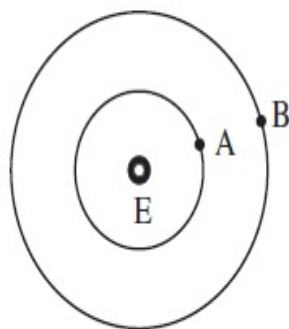
70819157920. $16\hat{i} + 24\hat{j} - 32\hat{k}$

Question Number : 6 Question Id : 70819117589 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Two satellites A and B of masses 200 kg and 400 kg are revolving round the earth at height of 600 km and 1600 km respectively.

If T_A and T_B are the time periods of A and B respectively then the value of $T_B - T_A$:



[Given : radius of earth = 6400 km, mass of earth = 6×10^{24} kg]

Options :

70819157921. 1.33×10^3 s

70819157922. 4.24×10^3 s

70819157923. 4.24×10^2 s

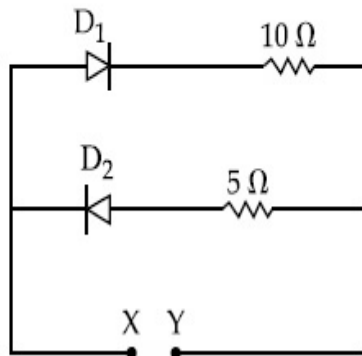
70819157924. 3.33×10^2 s

Question Number : 7 Question Id : 70819117590 Question Type : MCQ Opti

Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

A 5 V battery is connected across the points X and Y. Assume D_1 and D_2 to be normal silicon diodes. Find the current supplied by the battery if the +ve terminal of the battery is connected to point X.



Options :

70819157925. $\sim 0.5\ \text{A}$

70819157926. $\sim 0.43\ \text{A}$

70819157927. $\sim 0.86\ \text{A}$

70819157928. $\sim 1.5\ \text{A}$

Question Number : 8 Question Id : 70819117591 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Given below are two statements :

Statement I : A speech signal of 2 kHz is used to modulate a carrier signal of 1 MHz. The bandwidth requirement for the signal is 4 kHz.

Statement II : The side band frequencies are 1002 kHz and 998 kHz.

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

Options :

70819157929. Both Statement I and Statement II are true

70819157930. Both Statement I and Statement II are false

70819157931. Statement I is true but Statement II is false

70819157932. Statement I is false but Statement II is true

Question Number : 9 Question Id : 70819117592 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

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

Assertion A : When a rod lying freely is heated, no thermal stress is developed in it.

Reason R : On heating, the length of the rod increases.

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

Options :

70819157933. Both A and R are true and R is the correct explanation of A

70819157934. Both A and R are true but R is NOT the correct explanation of A

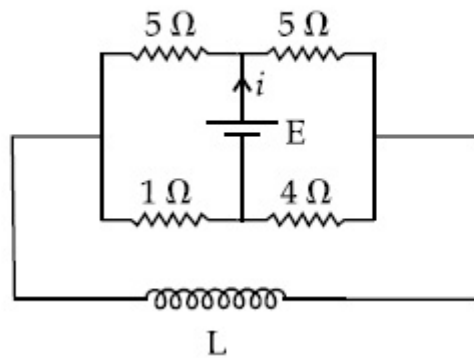
70819157935. A is true but R is false

70819157936. A is false but R is true

Question Number : 10 Question Id : 70819117593 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The current (i) at time $t=0$ and $t = \infty$ respectively for the given circuit is :



Options :

70819157937. $\frac{18E}{55}$, $\frac{5E}{18}$

70819157938. $\frac{5E}{18}$, $\frac{18E}{55}$

70819157939. $\frac{10E}{33}$, $\frac{5E}{18}$

70819157940. $\frac{5E}{18}$, $\frac{10E}{33}$

Question Number : 11 Question Id : 70819117594 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The pitch of the screw gauge is 1 mm and there are 100 divisions on the circular scale. When nothing is put in between the jaws, the zero of the circular scale lies 8 divisions below the reference line. When a wire is placed between the jaws, the first linear scale division is clearly visible while 72nd division on circular scale coincides with the reference line. The radius of the wire is :

Options :

70819157941. 1.64 mm

70819157942. 0.90 mm

70819157943. 0.82 mm

70819157944. 1.80 mm

**Question Number : 12 Question Id : 70819117595 Question Type : MCQ Option Shuffling : Yes
Is Question Mandatory : No**

Correct Marks : 4 Wrong Marks : 1

An α particle and a proton are accelerated from rest by a potential difference of 200 V. After

this, their de Broglie wavelengths are λ_α and λ_p respectively. The ratio $\frac{\lambda_p}{\lambda_\alpha}$ is :

Options :

70819157945. 2.8

70819157946. 8

70819157947. 7.8

70819157948. 3.8

**Question Number : 13 Question Id : 70819117596 Question Type : MCQ Option Shuffling : Yes
Is Question Mandatory : No**

Correct Marks : 4 Wrong Marks : 1

Two coherent light sources having intensity in the ratio $2x$ produce an interference pattern.

The ratio $\frac{I_{\max} - I_{\min}}{I_{\max} + I_{\min}}$ will be :

Options :

70819157949. $\frac{\sqrt{2x}}{2x+1}$

70819157950.

$$\frac{2\sqrt{2x}}{2x+1}$$

70819157951. $\frac{\sqrt{2x}}{x+1}$

70819157952. $\frac{2\sqrt{2x}}{x+1}$

Question Number : 14 Question Id : 70819117597 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

An engine of a train, moving with uniform acceleration, passes the signal-post with velocity u and the last compartment with velocity v . The velocity with which middle point of the train passes the signal post is :

Options :

70819157953. $\frac{u+v}{2}$

70819157954. $\frac{v-u}{2}$

70819157955. $\sqrt{\frac{v^2+u^2}{2}}$

70819157956. $\sqrt{\frac{v^2-u^2}{2}}$

Question Number : 15 Question Id : 70819117598 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

A proton, a deuteron and an α particle are moving with same momentum in a uniform magnetic field. The ratio of magnetic forces acting on them is _____ and their speed is _____, in the ratio.

Options :

70819157957. 4 : 2 : 1 and 2 : 1 : 1

70819157958. 2 : 1 : 1 and 4 : 2 : 1

70819157959. 1 : 2 : 4 and 1 : 1 : 2

70819157960. 1 : 2 : 4 and 2 : 1 : 1

Question Number : 16 Question Id : 70819117599 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Magnetic fields at two points on the axis of a circular coil at a distance of 0.05 m and 0.2 m from the centre are in the ratio 8 : 1. The radius of coil is _____.

Options :

70819157961. 0.1 m

70819157962. 0.15 m

70819157963. 0.2 m

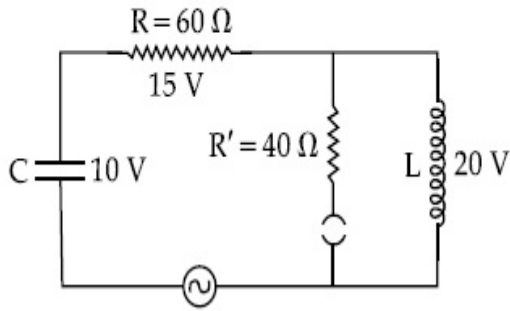
70819157964. 1.0 m

Question Number : 17 Question Id : 70819117600 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The angular frequency of alternating current in a L-C-R circuit is 100 rad/s . The components connected are shown in the figure. Find the value of inductance of the coil and capacity of condenser.



Options :

70819157965. 1.33 H and $250 \mu\text{F}$

70819157966. 1.33 H and $150 \mu\text{F}$

70819157967. 0.8 H and $150 \mu\text{F}$

70819157968. 0.8 H and $250 \mu\text{F}$

Question Number : 18 Question Id : 70819117601 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

A diatomic gas, having $C_P = \frac{7}{2}R$ and $C_V = \frac{5}{2}R$, is heated at constant pressure. The ratio $dU : dQ : dW$:

Options :

70819157969. 5 : 7 : 2

70819157970. 3 : 7 : 2

70819157971. 3 : 5 : 2

70819157972. 5 : 7 : 3

Question Number : 19 Question Id : 70819117602 Question Type : MCQ Option Shuffling : Yes
Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Two radioactive substances X and Y originally have N_1 and N_2 nuclei respectively. Half life of X is half of the half life of Y. After three half lives of Y, number of nuclei of both are equal.

The ratio $\frac{N_1}{N_2}$ will be equal to :

Options :

70819157973. $\frac{3}{1}$

70819157974. $\frac{1}{3}$

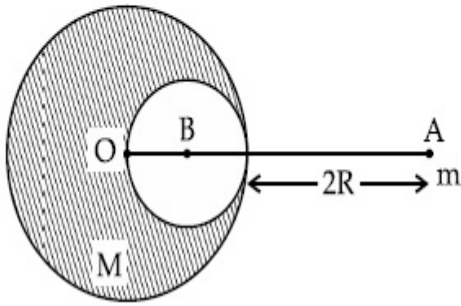
70819157975. $\frac{8}{1}$

70819157976. $\frac{1}{8}$

Question Number : 20 Question Id : 70819117603 Question Type : MCQ Option Shuffling : Yes
Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

A solid sphere of radius R gravitationally attracts a particle placed at $3R$ from its centre with a force F_1 . Now a spherical cavity of radius $\left(\frac{R}{2}\right)$ is made in the sphere (as shown in figure) and the force becomes F_2 . The value of $F_1 : F_2$ is :



Options :

70819157977. 41 : 50

70819157978. 50 : 41

70819157979. 36 : 25

70819157980. 25 : 36

Physics Section B

Section Id :	708191713
Section Number :	2
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	10
Number of Questions to be attempted :	5
Section Marks :	20
Mark As Answered Required? :	Yes
Sub-Section Number :	1
Sub-Section Id :	708191993

Question Shuffling Allowed :

Yes

Question Number : 21 Question Id : 70819117604 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

A monoatomic gas of mass 4.0 u is kept in an insulated container. Container is moving with velocity 30 m/s. If container is suddenly stopped then change in temperature of the gas

(R = gas constant) is $\frac{x}{3R}$. Value of x is _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

5 to 5.001

Question Number : 22 Question Id : 70819117605 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

512 identical drops of mercury are charged to a potential of 2 V each. The drops are joined to form a single drop. The potential of this drop is _____ V.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

5 to 5.001

Question Number : 23 Question Id : 70819117606 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

A coil of inductance 2 H having negligible resistance is connected to a source of supply whose voltage is given by $V = 3t$ volt. (where t is in second). If the voltage is applied when $t = 0$, then the energy stored in the coil after 4 s is _____ J.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

5 to 5.001

Question Number : 24 **Question Id :** 70819117607 **Question Type :** SA

Correct Marks : 4 **Wrong Marks :** 0

A small bob tied at one end of a thin string of length 1 m is describing a vertical circle so that the maximum and minimum tension in the string are in the ratio 5 : 1. The velocity of the bob at the highest position is _____ m/s. (Take $g = 10 \text{ m/s}^2$)

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

5 to 5.001

Question Number : 25 **Question Id :** 70819117608 **Question Type :** SA

Correct Marks : 4 **Wrong Marks :** 0

The potential energy (U) of a diatomic molecule is a function dependent on r (interatomic distance) as

$$U = \frac{\alpha}{r^{10}} - \frac{\beta}{r^5} - 3$$

where, α and β are positive constants. The equilibrium distance between two atoms will be

$$\left(\frac{2\alpha}{\beta}\right)^{\frac{a}{b}}, \text{ where } a = \underline{\hspace{2cm}}.$$

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

5 to 5.001

Question Number : 26 Question Id : 70819117609 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

The electric field in a region is given by $\vec{E} = \left(\frac{3}{5}E_0 \hat{i} + \frac{4}{5}E_0 \hat{j}\right) \frac{N}{C}$. The ratio of flux of reported

field through the rectangular surface of area 0.2 m^2 (parallel to $y-z$ plane) to that of the surface of area 0.3 m^2 (parallel to $x-z$ plane) is $a : b$, where $a = \underline{\hspace{2cm}}$.

[Here \hat{i} , \hat{j} and \hat{k} are unit vectors along x , y and z -axes respectively]

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

5 to 5.001

Question Number : 27 Question Id : 70819117610 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

A transmitting station releases waves of wavelength 960 m. A capacitor of $2.56 \mu\text{F}$ is used in the resonant circuit. The self inductance of coil necessary for resonance is _____ $\times 10^{-8}$ H.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

5 to 5.001

Question Number : 28 Question Id : 70819117611 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

The same size images are formed by a convex lens when the object is placed at 20 cm or at 10 cm from the lens. The focal length of convex lens is _____ cm.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

5 to 5.001

Question Number : 29 Question Id : 70819117612 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

In a certain thermodynamical process, the pressure of a gas depends on its volume as kV^3 . The work done when the temperature changes from 100°C to 300°C will be _____ nR, where n denotes number of moles of a gas.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

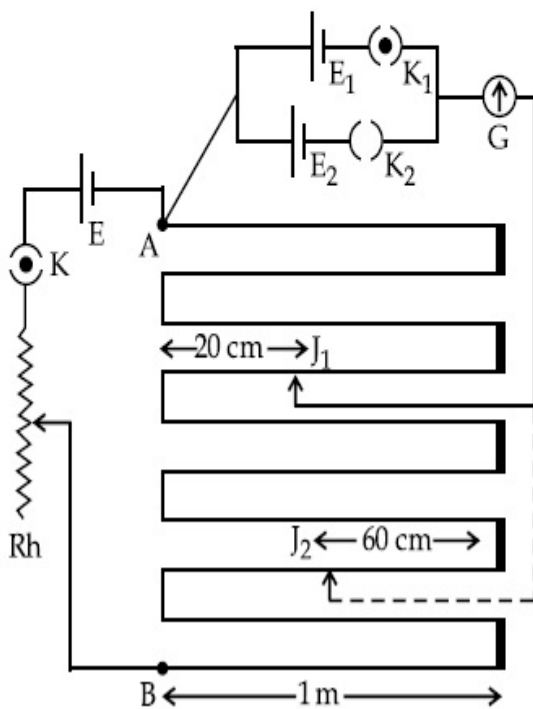
Possible Answers :

5 to 5.001

Question Number : 30 **Question Id :** 70819117613 **Question Type :** SA

Correct Marks : 4 **Wrong Marks :** 0

In the given circuit of potentiometer, the potential difference E across AB (10 m length) is larger than E_1 and E_2 as well. For key K_1 (closed), the jockey is adjusted to touch the wire at point J_1 so that there is no deflection in the galvanometer. Now the first battery (E_1) is replaced by second battery (E_2) for working by making K_1 open and K_2 closed. The galvanometer gives then null deflection at J_2 . The value of $\frac{E_1}{E_2}$ is $\frac{a}{b}$, where $a = \dots$.



Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

5 to 5.001