A1

ವರ್ಷನ್ ಕೋಡ್
21UGE

ಗರಿಷ್ಠ ಅಂಕಗಳು : **60**
ಒಟ್ಟು ಪ್ರಶ್ನೆಗಳು : **60**
ಒಟ್ಟು ಅವಧಿ : **80** ನಿಮಿಷಗಳು
ಉತ್ತರಿಸಲು ಇರುವ ಗರಿಷ್ಠ ಅವಧಿ : **70** ನಿಮಿಷಗಳು
ಸಮಯ : ಬೆ. **10.30** ರಿಂದ **11.50** ರ ವರೆಗೆ

ನಿಮ್ಮ ಸಿಇಟಿ ಸಂಖ್ಯೆಯನ್ನು ಬರೆಯಿರಿ

ಕ್ರಮ ಸಂಖ್ಯೆ : **705105**

ವಿಷಯ ಸಂಕೇತ **2P0829K**

ಮಾಡಿ

1. ಕೊಠಡಿ ಮೇಲ್ವಿಚಾರಕರಿಂದ ಈ ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆಯನ್ನು ನಿಮಗೆ ಬೆ. 10:30 ಆದ ನಂತರ ಕೊಡಲಾಗಿರುತ್ತದೆ.
2. ಅಭ್ಯರ್ಥಿಗಳು ಸಿಇಟಿ ಸಂಖ್ಯೆಯನ್ನು ಓ.ಎಂ.ಆರ್. ಉತ್ತರ ಪತ್ರಿಕೆಯಲ್ಲಿ ಬರೆದು ಅದಕ್ಕೆ ಸಂಬಂಧಿಸಿದ ವೃತ್ತಗಳನ್ನು ಸಂಪೂರ್ಣವಾಗಿ ತುಂಬಿದ್ದೀರೆಂದು ಖಾತ್ರಿಪಡಿಸಿಕೊಳ್ಳಿ.
3. ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆಯ ವರ್ಷನ್ ಕೋಡ್ ಅನ್ನು ಓ.ಎಂ.ಆರ್. ಉತ್ತರ ಪತ್ರಿಕೆಯಲ್ಲಿ ಬರೆದು ಅದಕ್ಕೆ ಸಂಬಂಧಿಸಿದ ವೃತ್ತಗಳನ್ನು ಸಂಪೂರ್ಣವಾಗಿ ತುಂಬಬೇಕು.
4. ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆಯ ವರ್ಷನ್ ಕೋಡ್ ಮತ್ತು ಕ್ರಮ ಸಂಖ್ಯೆಯನ್ನು ನಾಮಿನಲ್ ರೋಲ್‌ನಲ್ಲಿ ತಪ್ಪಿಲ್ಲದೆ ಬರೆಯಬೇಕು.
5. ಓ.ಎಂ.ಆರ್. ಉತ್ತರ ಪತ್ರಿಕೆಯ ಕೆಳಭಾಗದ ನಿಗದಿತ ಜಾಗದಲ್ಲಿ ಪೂರ್ಣ ಸಹಿ ಮಾಡಬೇಕು.

ಮಾಡಬೇಡಿ

1. ಓ.ಎಂ.ಆರ್. ಉತ್ತರ ಪತ್ರಿಕೆಯಲ್ಲಿ ಮುದ್ರಿತವಾಗಿರುವ ಟೈಮಿಂಗ್ ಮಾರ್ಕನ್ನು ತಿದ್ದಬಾರದು / ಹಾಳುಮಾಡಬಾರದು / ಅಳಿಸಬಾರದು.
2. ಮೂರನೇ ಬೆಲ್ ಬೆ. 10.40 ಕ್ಕೆ ಆಗುತ್ತದೆ. ಅಲ್ಲಿಯವರೆಗೂ,
   - ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆಯ ಬಲಭಾಗದಲ್ಲಿರುವ ಸೀಲ್ ಅನ್ನು ತೆಗೆಯಬಾರದು.
   - ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆಯ ಒಳಗಡೆ ಇರುವ ಪ್ರಶ್ನೆಗಳನ್ನು ನೋಡಲು ಪ್ರಯತ್ನಿಸಬಾರದು ಮತ್ತು ಓ.ಎಂ.ಆರ್. ಉತ್ತರ ಪತ್ರಿಕೆಯಲ್ಲಿ ಉತ್ತರಿಸಲು ಪ್ರಾರಂಭಿಸಬಾರದು.

ಅಭ್ಯರ್ಥಿಗಳಿಗೆ ಮುಖ್ಯ ಸೂಚನೆಗಳು

1. ಪ್ರಶ್ನೆಗಳಲ್ಲಿ ಬಳಸಿರುವ signs and symbols ಗಳನ್ನು, ಬೇರೆ ರೀತಿಯಲ್ಲಿ ಹೇಳದ ಹೊರತು, ನಿಗದಿತ ಪಠ್ಯಪುಸ್ತಕದಲ್ಲಿನ ಅರ್ಥವನ್ನು ಪರಿಗಣಿಸಬೇಕು.
2. ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆಯಲ್ಲಿ ಒಟ್ಟು 60 ಪ್ರಶ್ನೆಗಳಿದ್ದು, ಪ್ರತಿ ಪ್ರಶ್ನೆಗೂ 4 ಬಹು ಆಯ್ಕೆ ಉತ್ತರಗಳು ಇರುತ್ತವೆ. ಪ್ರತಿ ಪ್ರಶ್ನೆಯ ಕೆಳಗೆ ಕೊಟ್ಟಿರುವ ನಾಲ್ಕು ಬಹು ಆಯ್ಕೆಯ ಉತ್ತರಗಳಲ್ಲಿ ಸರಿಯಾದ ಒಂದು ಉತ್ತರವನ್ನು ಆಯ್ಕೆ ಮಾಡಿ.
3. ಮೂರನೇ ಬೆಲ್ ಅಂದರೆ ಬೆ. 10.40ರ ನಂತರ ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆಯ ಬಲಭಾಗದಲ್ಲಿರುವ ಸೀಲ್ ತೆಗೆದು ಈ ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆಯಲ್ಲಿ ಯಾವುದೇ ಪುಟಗಳು ಮುದ್ರಿತವಾಗಿಲ್ಲದೇ ಇರುವುದು ಕಂಡು ಬಂದಲ್ಲಿ ಅಥವಾ ಹರಿದು ಹೋಗಿದ್ದಲ್ಲಿ ಅಥವಾ ಯಾವುದೇ ಐಟಂಗಳು ಬಿಟ್ಟುಹೋಗಿದ್ದಲ್ಲಿ ಎಂಬುದನ್ನು ಖಚಿತಪಡಿಸಿಕೊಂಡು, ಈ ರೀತಿ ಆಗಿದ್ದರೆ ಪ್ರಶ್ನೆಪತ್ರಿಕೆಯನ್ನು ಬದಲಾಯಿಸಿ ಕೊಳ್ಳುವುದು ನಂತರ ಓ.ಎಂ.ಆರ್. ಉತ್ತರ ಪತ್ರಿಕೆಯಲ್ಲಿ ಉತ್ತರಿಸಲು ಪ್ರಾರಂಭಿಸುವುದು.
4. ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆಯಲ್ಲಿನ ಪ್ರಶ್ನೆಗೆ ಅನುಗುಣವಾಗಿರುವ ಸರಿ ಉತ್ತರವನ್ನು ಓ.ಎಂ.ಆರ್. ಉತ್ತರ ಪತ್ರಿಕೆಯಲ್ಲಿ ಅದೇ ಕ್ರಮ ಸಂಖ್ಯೆಯ ಮುಂದೆ ನೀಡಿರುವ ಸಂಬಂಧಿಸಿದ ವೃತ್ತವನ್ನು ನೀಲಿ ಅಥವಾ ಕಪ್ಪು ಶಾಯಿಯ ಬಾಲ್ ಪಾಯಿಂಟ್ ಪೆನ್‌ನಿಂದ ಸಂಪೂರ್ಣ ತುಂಬುವುದು.

ಸರಿಯಾದ ಕ್ರಮ CORRECT METHOD				ತಪ್ಪು ಕ್ರಮಗಳು WRONG METHODS							
(A)	●	(C)	(D)	⊗	(B)	(C)	(D)	(A)	●	●	(D)
				◉	(B)	(C)	(D)	(A)	◉	(C)	(D)

5. ಈ ಓ.ಎಂ.ಆರ್. ಉತ್ತರ ಪತ್ರಿಕೆಯನ್ನು ಸ್ಕ್ಯಾನ್ ಮಾಡುವ ಸ್ಕ್ಯಾನರ್ ಬಹಳ ಸೂಕ್ಷ್ಮವಾಗಿದ್ದು ಸಣ್ಣ ಗುರುತನ್ನು ಸಹ ದಾಖಲಿಸುತ್ತದೆ. ಆದ್ದರಿಂದ ಓ.ಎಂ.ಆರ್. ಉತ್ತರ ಪತ್ರಿಕೆಯಲ್ಲಿ ಉತ್ತರಿಸುವಾಗ ಎಚ್ಚರಿಕೆ ವಹಿಸಿ.
6. ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆಯಲ್ಲಿ ಕೊಟ್ಟಿರುವ ಖಾಲಿ ಜಾಗವನ್ನು ರಫ್ ಕೆಲಸಕ್ಕೆ ಉಪಯೋಗಿಸಿ. ಓ.ಎಂ.ಆರ್. ಉತ್ತರ ಪತ್ರಿಕೆಯನ್ನು ಇದಕ್ಕೆ ಉಪಯೋಗಿಸಬೇಡಿ.
7. ಕೊನೆಯ ಬೆಲ್ ಅಂದರೆ ಬೆ. 11.50 ಆದ ನಂತರ ಉತ್ತರಿಸುವುದನ್ನು ನಿಲ್ಲಿಸಿ.
8. ಓ.ಎಂ.ಆರ್. ಉತ್ತರ ಪತ್ರಿಕೆಯನ್ನು ಕೊಠಡಿ ಮೇಲ್ವಿಚಾರಕರಿಗೆ ಯಥಾಸ್ಥಿತಿಯಲ್ಲಿ ನೀಡಿರಿ.
9. ಕೊಠಡಿ ಮೇಲ್ವಿಚಾರಕರು ಮೇಲ್ಕಾಗದ ಹಾಳೆಯನ್ನು ಪ್ರತ್ಯೇಕಿಸಿ (ಕಚೇರಿ ಪ್ರತಿ) ತನ್ನ ವಶದಲ್ಲಿ ಇಟ್ಟುಕೊಂಡು ತಳಬದಿಯ ಯಥಾಪ್ರತಿಯನ್ನು (ಅಭ್ಯರ್ಥಿಯ ಪ್ರತಿ) ಅಭ್ಯರ್ಥಿಗಳಿಗೆ ಕೊಡುತ್ತಾರೆ.

ಸೂಚನೆ: ಕನ್ನಡ ಆವೃತ್ತಿಯ ಪ್ರಶ್ನೆಗಳಲ್ಲಿ ಉತ್ತರಿಸುವ ಅಭ್ಯರ್ಥಿಗಳಿಗೆ ಕನ್ನಡದಲ್ಲಿ ಮುದ್ರಿತವಾಗಿರುವ ಪ್ರಶ್ನೆಗಳ ಬಗ್ಗೆ ಏನಾದರೂ ಸಂದೇಹವಿದ್ದಲ್ಲಿ ಇಂಗ್ಲೀಷ್ ಆವೃತ್ತಿಯ ಪ್ರಶ್ನೆಪತ್ರಿಕೆಯನ್ನು ನೋಡಬಹುದು. ಏನಾದರೂ ವ್ಯತ್ಯಾಸ ಕಂಡುಬಂದಲ್ಲಿ ಇಂಗ್ಲೀಷ್ ಆವೃತ್ತಿಯನ್ನು ಅಂತಿಮ ಎಂದು ಪರಿಗಣಿಸಲಾಗುವುದು.

DO NOT WRITE HERE

A1	Maximum Marks : 60 Total No. of Questions : 60 Total Duration : 80 Minutes Maximum Time for Answering : 70 Minutes Time : 10.30 am to 11.50 am	Serial Number :
VERSION CODE	MENTION YOUR CET NUMBER	Subject Code 2P0829K
21UGE		

Dos:

1. This question booklet is issued to you by the room invigilator after 10.30 am.
2. Check whether the CET Number has been entered and shaded in the respective circles on the OMR answer sheet.
3. The version code of this question booklet should be entered on the OMR answer sheet and the respective circles should also be shaded completely.
4. The Version Code and Serial Number of this question booklet should be entered on the Nominal Roll without any mistakes.
5. Compulsorily sign at the bottom portion of the OMR answer sheet in the space provided.

DONTs:

1. **THE TIMING AND MARKS PRINTED ON THE OMR ANSWER SHEET SHOULD NOT BE DAMAGED / MUTILATED / SPOILED.**
2. The **3rd Bell rings at 10.40 am, till then**
   - Do not remove the seal present on the right hand side of this question booklet.
   - Do not look inside this question booklet or start answering on the OMR answer sheet.

IMPORTANT INSTRUCTIONS TO CANDIDATES

1. In case of usage of signs and symbols in the questions, the regular textbook connotation should be considered unless stated otherwise.
2. This question booklet contains 60 questions and each question will have one statement and four different options / responses & out of which you have to choose one correct answer.
3. After the **3rd Bell rings at 10.40 am,** remove the paper seal of this question booklet and check that this booklet does not have any unprinted or torn or missing pages or items etc., if so, get it replaced by a complete test booklet. Read each item and start answering on the OMR answer sheet.
4. Completely **darken / shade** the relevant circle with a **blue or black ink ballpoint pen against the question number on the OMR answer sheet.**

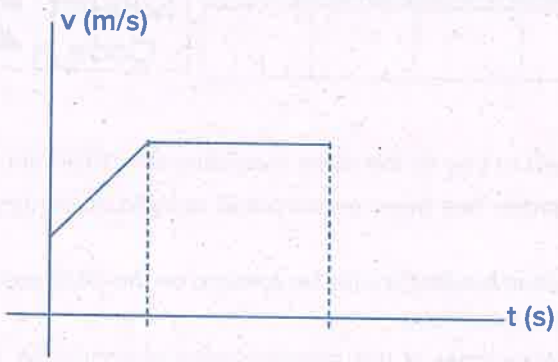
ಸರಿಯಾದ ಕ್ರಮ CORRECT METHOD	ತಪ್ಪು ಕ್ರಮಗಳು WRONG METHODS
(A) ● (C) (D)	⊗ (B) (C) (D) (A) (B) (C) ✓ (A) ● ● (D) ● (B) (C) (D) (A) ● (C) (D)

5. Please note that even a minute unintended ink dot on the OMR answer sheet will also be recognized and recorded by the scanner. Therefore, avoid multiple markings of any kind on the OMR answer sheet.
6. Use the space provided on each page of the question booklet for Rough Work. Do not use the OMR answer sheet for the same.
7. **Last Bell will ring at 11.50 am,** stop writing on the OMR answer sheet.
8. Hand over the **OMR answer sheet** to the room invigilator as it is.
9. After separating the top sheet (Office copy), the invigilator will return the bottom sheet replica (Candidate's copy) to you.

NOTE: In case of any discrepancy between English and Kannada Versions, the English version will be taken as final.

PHYSICS

1. For a body moving along a straight line, the following v-t graph is obtained.



According to the graph, the displacement during

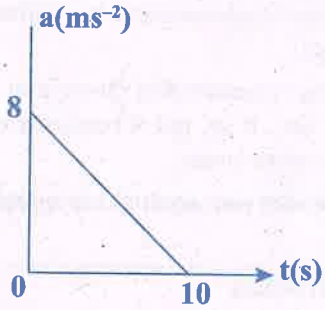
(A) Uniform acceleration is greater than that during uniform motion.

(B) Uniform acceleration is less than that during uniform motion.

(C) Uniform acceleration is equal to that during uniform motion.

(D) Uniform motion is zero.

2. A particle starts from rest. Its acceleration 'a' versus time 't' is shown in the figure. The maximum speed of the particle will be:



(A) 80 ms^{-1}

(B) 40 ms^{-1}

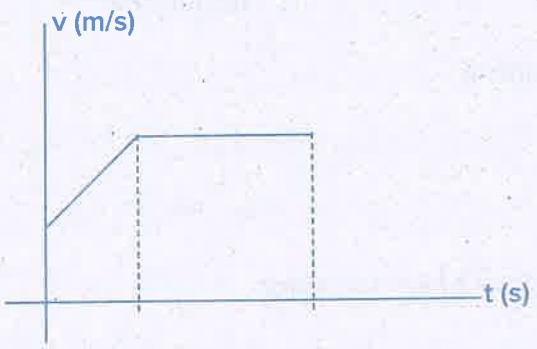
(C) 18 ms^{-1}

(D) 2 ms^{-1}

SPACE FOR ROUGH WORK

ಭೌತ ಶಾಸ್ತ್ರ

1. ಸರಳ ರೇಖೆಯಲ್ಲಿ ಚಲಿಸುತ್ತಿರುವ ವಸ್ತುವಿನ v-t ಗ್ರಾಫ್ ನಕ್ಷೆ ನೀಡಲಾಗಿದೆ.



ನಕ್ಷೆಯ ಪ್ರಕಾರ ವಸ್ತುವಿನ ಸ್ಥಾನ ಪಲ್ಲಟವು

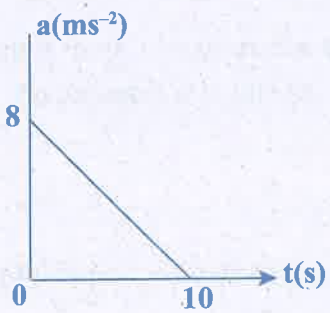
(A) ಏಕರೂಪ ವೇಗೋತ್ಕರ್ಷದ ಅವಧಿಯಲ್ಲಿ ಹೆಚ್ಚಿದ್ದು ಏಕರೂಪ ಚಲನೆಯ ಅವಧಿಯಲ್ಲಿ ಕಡಿಮೆ ಇರುತ್ತದೆ.

(B) ಏಕರೂಪ ವೇಗೋತ್ಕರ್ಷದಅವಧಿಯಲ್ಲಿಕಡಿಮೆಇದ್ದುಏಕರೂಪ ಚಲನೆಯ ಅವಧಿಯಲ್ಲಿ ಹೆಚ್ಚಿರುತ್ತದೆ.

(C) ಏಕರೂಪ ವೇಗೋತ್ಕರ್ಷದ ಅವಧಿಯಲ್ಲಿ ಮತ್ತು ಏಕರೂಪ ಚಲನೆಯ ಅವಧಿಯಲ್ಲಿ ಸಮನಾಗಿರುತ್ತದೆ.

(D) ಏಕರೂಪ ಚಲನೆಯ ಅವಧಿಯಲ್ಲಿ ಸೊನ್ನೆಯಾಗಿರುತ್ತದೆ.

2. ನಿಶ್ಚಲ ಸ್ಥಿತಿಯಲ್ಲಿರುವ ಒಂದು ಕಣವು ಚಲಿಸಲು ಆರಂಭಿಸಿದೆ. ಕಣದ ವೇಗೋತ್ಕರ್ಷ 'a' ವಿರುದ್ಧ ಕಾಲ 't' ನ ಚಿತ್ರದಲ್ಲಿ ತೋರಿಸಲಾಗಿದೆ. ಕಣದ ಗರಿಷ್ಟ ಜವವು :



(A) 80 ms^{-1}

(B) 40 ms^{-1}

(C) 18 ms^{-1}

(D) 2 ms^{-1}

SPACE FOR ROUGH WORK

The maximum range of a gun on horizontal plane is 16 km. If $g = 10 ms^{-2}$, then muzzle velocity of a shell is

(A) 160 ms^{-1}

(B) 200 $\sqrt{2}$ ms^{-1}

(C) 400 ms^{-1}

(D) 800 ms^{-1}

The trajectory of a projectile is

(A) semicircle

(B) an ellipse

(C) a parabola always

(D) a parabola in the absence of air resistance

For a projectile motion, the angle between the velocity and acceleration is minimum and acute at

(A) only one point

(B) two points

(C) three points

(D) four points

A particle starts from the origin at t = 0 s with a velocity of $10\hat{j}$ ms^{-1} and moves in the x–y plane with a constant acceleration of $(8\hat{i} + 2\hat{j})$ ms^{-2}. At an instant when the x-cordinate of the particle is 16 m, y-cordinate of the particle is :

(A) 16 m

(B) 28 m

(C) 36 m

(D) 24 m

A coin placed on a rotating turn table just slips if it is placed at a distance of 4 cm from the centre. If the angular velocity of the turn table is doubled it will just slip at a distance of:

(A) 1 cm

(B) 2 cm

(C) 4 cm

(D) 8 cm

A 1 kg ball moving at 12 ms^{-1} collides with a 2 kg ball moving in opposite direction at 24 ms^{-1}. If the coefficient of restitution is $\frac{2}{3}$, then their velocities after the collision are

(A) – 4 ms^{-1}, – 28 ms^{-1}

(B) – 28 ms^{-1}, – 4 ms^{-1}

(C) 4 ms^{-1}, 28 ms^{-1}

(D) 28 ms^{-1}, 4 ms^{-1}

SPACE FOR ROUGH WORK

3. ಕ್ಷಿತಿಜೀಯ ಸಮತಲದಲ್ಲಿ ಒಂದು ತುಪಾಕಿಯ ಗರಿಷ್ಟ ವ್ಯಾಪ್ತಿ 16 km ಇದೆ. ಇಲ್ಲಿ $g = 10 ms^{-2}$. ಆದರೆ ಸಿಡಿಮದ್ದಿ ಮೂಲ ವೇಗವು

(A) $160\ ms^{-1}$ (B) $200\sqrt{2}\ ms^{-1}$

(C) $400\ ms^{-1}$ (D) $800\ ms^{-1}$

4. ಒಂದು ಉತ್ಪೇಕ್ಷೆಪಕದ ಪಥವು

(A) ಅರ್ಧ ವೃತ್ತಾಕಾರದ್ದಾಗಿದೆ.

(B) ಅಂಡಾಕೃತಿಯದ್ದಾಗಿದೆ.

(C) ಯಾವಾಗಲೂ ಪರವಲಯವೇ ಆಗಿರುತ್ತದೆ.

(D) ಗಾಳಿಯ ರೋಧವಿಲ್ಲದಿದ್ದಾಗ ಪರವಲಯ ಆಗಿರುತ್ತದೆ.

5. ಒಂದು ಉತ್ಪೇಕ್ಷೆಪಕದ ಚಲನೆಯಲ್ಲಿ ವೇಗ ಮತ್ತು ವೇಗೋತ್ಕರ್ಷದ ದಿಕ್ಕುಗಳ ನಡುವಿನ ಕೋನವು ಕನಿಷ್ಟ ಮತ್ತ ಲಘು ಕೋನವಾಗಿರುವುದು.

(A) ಒಂದು ಬಿಂದುವಿನಲ್ಲಿ ಮಾತ್ರ (B) ಎರಡು ಬಿಂದುಗಳಲ್ಲಿ

(C) ಮೂರು ಬಿಂದುಗಳಲ್ಲಿ (D) ನಾಲ್ಕು ಬಿಂದುಗಳಲ್ಲಿ

6. x–y ಸಮತಲದಲ್ಲಿ ಒಂದು ಕಣವು ಮೂಲಬಿಂದುವಿನಿಂದ $t = 0$ ಸೆ ನಲ್ಲಿ $10\hat{j}$ ಮೀ ಸೆ$^{-1}$ ವೇಗ ಮತ್ತ $(8\hat{i} + 2\hat{j})$ ಮೀ ಸೆ$^{-2}$ ನ ಸ್ಥಿರ ವೇಗೋತ್ಕರ್ಷದಲ್ಲಿ ಆರಂಭವಾಗಿದೆ. ಆ ಕ್ಷಣದಲ್ಲಿ 16 ಮೀ x - ಸಹಯೋಜನದ ಕಣವು ಇದ್ದಾಗ, ಕಣದ y - ಸಹಯೋಜನವು.

(A) 16 ಮೀ (B) 28 ಮೀ

(C) 36 ಮೀ (D) 24 ಮೀ

7. ತಿರುಗುತ್ತಿರುವ ಒಂದು ಟೇಬಲ್ ನ ಮೇಲಿರುವ ನಾಣ್ಯವು, ಕೇಂದ್ರದಿಂದ 4 ಸೆಂ. ಮೀ ದೂರದಲ್ಲಿದ್ದಾಗ ತಕ್ಷ ಜಾರುತ್ತದೆ. ಟೇಬಲ್ ನ ಕೋನೀಯ ವೇಗವನ್ನು ದ್ವಿಗುಣ ಗೊಳಿಸಿದಾಗ ,ಅದು ಜಾರಲು ಶುರುವಾಗುವ ದೂರ ಕೇಂದ್ರದಿಂದ

(A) 1 ಸೆಂ. ಮೀ (B) 2 ಸೆಂ. ಮೀ

(C) 4 ಸೆಂ. ಮೀ (D) 8 ಸೆಂ. ಮೀ

8. $12\ ms^{-1}$ ದಿಂದ ಚಲಿಸುತ್ತಿರುವ 1 kgಯ ಚೆಂಡೊಂದು $24 ms^{-1}$ ದಿಂದ ವಿರುದ್ಧ ದಿಕ್ಕಿನಲ್ಲಿ ಚಲಿಸುತ್ತಿರುವ 2 ಚೆಂಡನ್ನು ತಾಡಿಸುತ್ತದೆ. ಪುನಸ್ಥಾಪನ ಸಹಾಂಕ $\frac{2}{3}$ ಆದರೆ, ತಾಡನೆ ನಂತರ ಅವುಗಳ ವೇಗವು

(A) $-4\ ms^{-1}, -28\ ms^{-1}$ (B) $-28\ ms^{-1}, -4\ ms^{-1}$

(C) $4\ ms^{-1}, 28\ ms^{-1}$ (D) $28\ ms^{-1}, 4\ ms^{-1}$

SPACE FOR ROUGH WORK

A ball hits the floor and rebounds after an inelastic collision. In this case

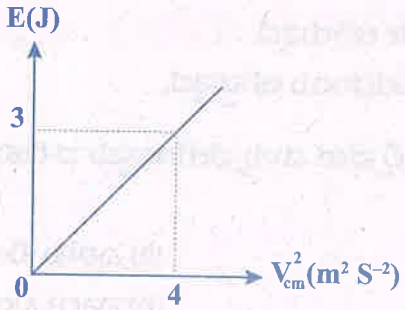
(A) the momentum of the ball is conserved

(B) the mechanical energy of the ball is conserved

(C) the total momentum of the ball and the earth is conserved

(D) the total mechanical energy of the ball and the earth is conserved

In figure E and V_{cm} represent the total energy and speed of centre of mass of an object of mass 1 kg in pure rolling. The object is:



(A) sphere

(B) ring

(C) disc

(D) Hollow Cylinder

Two bodies of masses 8 kg are placed at the vertices A and B of an equilateral triangle ABC. A third body of mass 2 kg is placed at the centroid G of the triangle. If AG = BG = CG = 1 m, where should a fourth body of mass 4 kg be placed so that the resultant force on the 2 kg body is zero?

(A) at C

(B) at a point P on the line CG such that PG = $\frac{1}{\sqrt{2}}$ m

(C) at a point P on the line CG such that PG = 0.5 m

(D) at a point P on the line CG such that PG = 2m

Two capillary tubes P and Q are dipped vertically in water. The height of water level in capillary tube P is $\frac{2}{3}^{rd}$ of the height in capillary tube Q. The ratio of their diameter is _____.

(A) 2 : 3

(B) 3 : 2

(C) 3 : 4

(D) 4 : 3

SPACE FOR ROUGH WORK

9. ಅಸ್ಥಿತಿ ಸ್ಥಾಪಕತ್ವ ಸಂಘಟ್ಟನೆಯ ನಂತರ ಒಂದು ಚೆಂಡು ನೆಲಕ್ಕೆ ಬಡಿದಿದೆ ನಂತರ ಪುಟಿದಿದೆ. ಈ ವಿಚಾರದಲ್ಲಿ

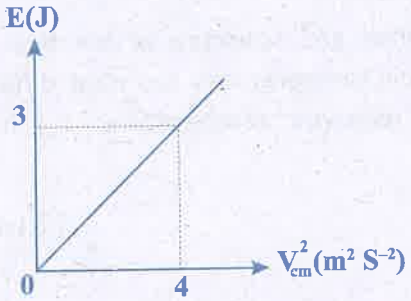
(A) ಚೆಂಡಿನ ಸಂವೇಗವು ಸ್ಥಿರವಾಗಿರುತ್ತದೆ

(B) ಚೆಂಡಿನ ಯಾಂತ್ರಿಕ ಶಕ್ತಿಯು ಸ್ಥಿರವಾಗಿರುತ್ತದೆ

(C) ಚೆಂಡಿನ ಹಾಗೂ ಭೂಮಿಯ ಒಟ್ಟು ಸಂವೇಗವು ಸ್ಥಿರವಾಗಿರುತ್ತದೆ

(D) ಚೆಂಡಿನ ಹಾಗೂ ಭೂಮಿಯ ಒಟ್ಟು ಯಾಂತ್ರಿಕ ಶಕ್ತಿಯು ಸ್ಥಿರವಾಗಿರುತ್ತದೆ

10. ಚಿತ್ರದಲ್ಲಿ E ಮತ್ತು V_{cm} ಎಂಬುದು 1 kg ರಾಶಿಯುಳ್ಳ ಕಾಯದ ಒಟ್ಟು ಶಕ್ತಿ ಮತ್ತು ರಾಶಿಕೇಂದ್ರದ ಜವವನ ಪ್ರತಿನಿಧಿಸುತ್ತದೆ. ಕಾಯವು



(A) ಗೋಳ

(B) ಉಂಗುರ

(C) ಡಿಸ್ಕ್

(D) ಟೊಳ್ಳಾದ ಸಿಲಿಂಡರ್

11. ರಾಶಿ 8 kg ಇರುವ ಎರಡು ಕಾಯಗಳನ್ನು ಸಮಬಾಹು ತ್ರಿಭುಜ ABC ಯ A ಮತ್ತು B ಶೃಂಗಗಳಲ್ಲಿ ಇಡಲಾಗಿ ರಾಶಿ 2 kg ಇರುವ ಮೂರನೇ ಕಾಯವನ್ನು ತ್ರಿಭುಜ ಕೇಂದ್ರ G ನಲ್ಲಿ ಇಡಲಾಗಿದೆ. AG = BG = CB = 1 m ಆದ 4 kg ರಾಶಿ ಇರುವ ಕೀಯವನ್ನು ಎಲ್ಲಿಟ್ಟರೆ, 2 kg ಕಾಯದ ಮೇಲೆ ಫಲಿತ ಬಲವು ಸೊನ್ನೆಯಾಗಿರುತ್ತದೆ ?

(A) ಶೃಂಗ C ನಲ್ಲಿ

(B) CG ರೇಖೆಯ ಮೇಲಿರುವ P ಬಿಂದುವಿನಲ್ಲಿ PG = $\frac{1}{\sqrt{2}}$ m ಇರುವಂತೆ

(C) CG ರೇಖೆಯ ಮೇಲಿರುವ P ಬಿಂದುವಿನಲ್ಲಿ PG = 0.5 m ಇರುವಂತೆ

(D) CG ರೇಖೆಯ ಮೇಲಿರುವ P ಬಿಂದುವಿನಲ್ಲಿ PG = 2m ಇರುವಂತೆ

12. ಎರಡು ಲೋಮನಾಳ P ಮತ್ತು Q ಗಳನ್ನು ನೀರಿನಲ್ಲಿ ಲಂಬವಾಗಿ ಮುಳುಗಿಸಿದೆ. ಲೋಮನಾ P ನಲ್ಲಿರುವ ನೀರಿನ ಮಟ್ಟದ ಎತ್ತರ, ಲೋಮನಾಳ Q ನಲ್ಲಿರುವ ಎತ್ತರದ $\frac{2}{3}$ ರಷ್ಟಿದೆ. ಅವುಗಳ ವ್ಯಾಸ ಅನುಪಾತವು ----------

(A) 2 : 3

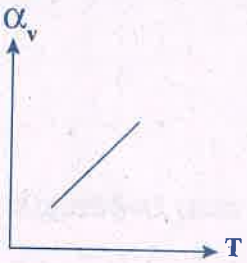
(B) 3 : 2

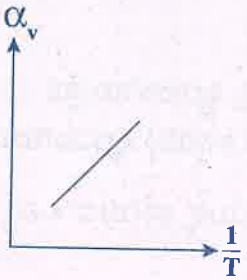
(C) 3 : 4

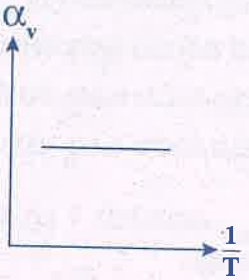
(D) 4 : 3

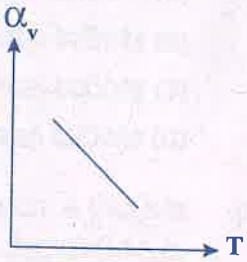
SPACE FOR ROUGH WORK

Which of the following curves represent the variation of coefficient of volume expansion of an ideal gas at constant pressure?

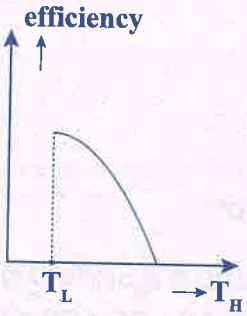
(A) 

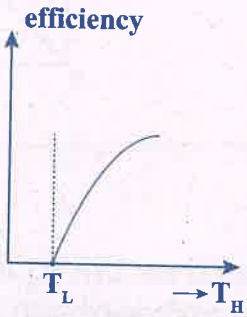
(B) 

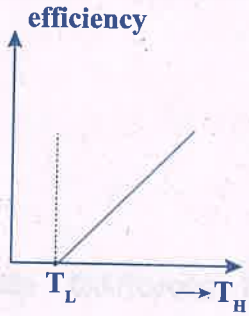
(C) 

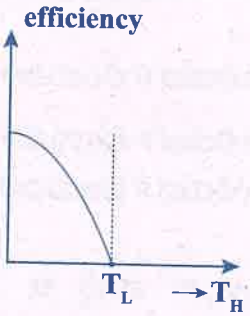
(D) 

A number of Carnot engines are operated at identical cold reservoir temperatures (T_L). However, their hot reservoir temperatures are kept different. A graph of the efficiency of the engines versus hot reservoir temperature (T_H) is plotted. The correct graphical representation is

(A) 

(B) 

(C) 

(D) 

A gas mixture contains monoatomic and diatomic molecules of 2 moles each. The mixture has a total internal energy of (symbols have usual meanings)

(A) 3 RT

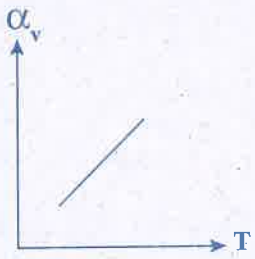
(B) 5 RT

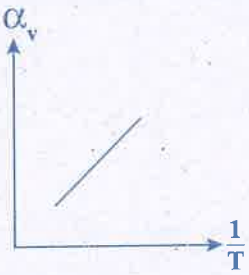
(C) 8 RT

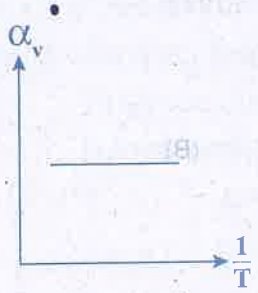
(D) 9 RT

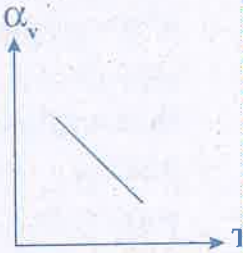
SPACE FOR ROUGH WORK

13. ಈ ಕೆಳಗಿನವುಗಳಲ್ಲಿ ಯಾವ ನಕ್ಷೆಯು ಸ್ಥಿರ ಒತ್ತಡದಲ್ಲಿ, ಆದರ್ಶ ಅನಿಲದ ಗಾತ್ರ ಹಿಗ್ಗುವಿಕೆಯ ಸಹಗುಣಾಂಕ
ಏರಿಳಿತವನ್ನು ಪ್ರತಿನಿಧಿಸುತ್ತದೆ ?

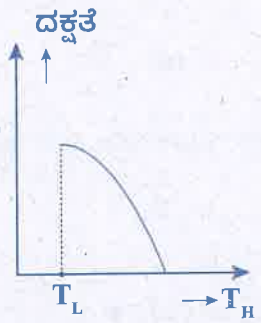
(A) 

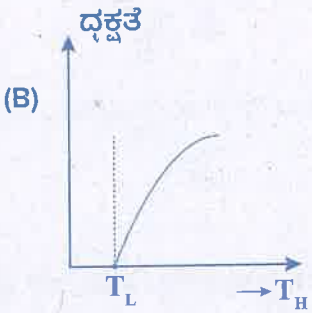
(B) 

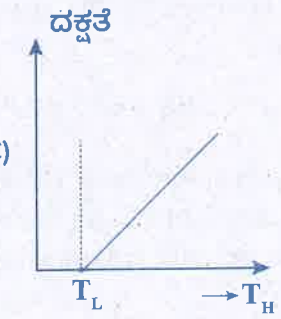
(C) 

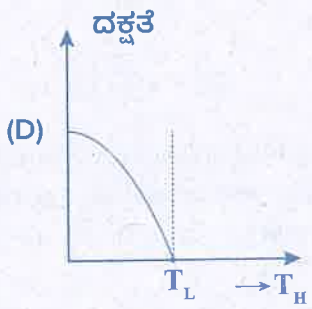
(D) 

14. ಶೀತ ಶಾಖಾಶಯ ತಾಪಮಾನ (T_L) ಸ್ಥಿರವಾಗಿರಿಸಿ ಹಲವು ಕಾರ್ನಾಟ್ ಶಾಖ ಯಂತ್ರಗಳನ
ಕಾರ್ಯಾಚರಿಸುವಂತೆ ಮಾಡಲಾಗಿದೆ. ಆದರೆ ಅವುಗಳ ಉಷ್ಣ ಶಾಖಾಶಾಯಗಳ ತಾಪಮಾನ (T_H) ಭಿನ್ನವಾ
ಇಡಲಾಗಿದೆ. ಶಾಖಾಯಂತ್ರಗಳ ದಕ್ಷತೆಯನ್ನು ಉಷ್ಣ ಶಾಖಾಶಾಯ ತಾಪಮಾನದ ಜತೆ ಬದಲಾಗುವುದನ
ಸೂಚಿಸುವ ಗ್ರಾಫ್ ನಕ್ಷೆಯನ್ನು ಬಿಡಿಸಲಾಗಿದೆ. ಹಾಗಾದರೆ ಈ ಬದಲಾವಣೆಯನ್ನು ಸರಿಯಾಗಿ ಪ್ರತಿನಿಧಿಸು
ಗ್ರಾಫ್ ನಕ್ಷೆ ದಕ್ಷತೆ

(A) 

(B) 

(C) 

(D) 

15. ಒಂದು ಅನಿಲ ಮಿಶ್ರಣದಲ್ಲಿ ಏಕ ಪರಮಾಣ್ವಿಕ ಮತ್ತು ದ್ವಿ ಪರಮಾಣ್ವಿಕ ಅಣುಗಳು ತಲಾ 2 ಮೋಲ್ ನಷ್ಟಿ
ಮಿಶ್ರಣದ ಒಟ್ಟು ಆಂತರಿಕ ಶಕ್ತಿಯು ಇಷ್ಟಾಗಿರುತ್ತದೆ. (ಸಂಕೇತಗಳು ಸಾಮಾನ್ಯ ಅರ್ಥ ಹೊಂದಿವೆ)

(A) 3 RT
(B) 5 RT
(C) 8 RT
(D) 9 RT

SPACE FOR ROUGH WORK

5. A pendulum oscillates simple harmonically if and only if

(I) the size of the bob of pendulum is negligible in comparison with the length of the pendulum.

(II) the angular amplitude is less than 10°.

(A) Both (I) and (II) are correct

(B) Both (I) and (II) are incorrect

(C) Only (I) is correct

(D) Only (II) is correct

To propagate both longitudinal and transverse waves, a material must have

(A) Bulk and shear moduli (B) Only bulk modulus

(C) Only shear modulus (D) Young's and Bulk modulus

A copper rod AB of length l is rotated about end A with a constant anglular velocity ω. The electric field at a distance x from the axis of rotation is

(A) $\frac{m\omega^2 x}{e}$ (B) $\frac{m\omega x}{el}$ (C) $\frac{mx}{\omega^2 l}$ (D) $\frac{me}{\omega^2 x}$

Electric field due to infinite, straight uniformly charged wire varies with distance 'r' as

(A) r (B) $\frac{1}{r}$ (C) $\frac{1}{r^2}$ (D) r^2

A 2 - gram object, located in a region of uniform electric field $\vec{E} = (300\ N\ C^{-1})\ \hat{i}$ carries a charge Q. The object released from rest at x = 0, has a kinetic energy of 0.12 J at x = 0.5 m. Then Q is

(A) 400 μc (B) – 400 μc (C) 800 μc (D) – 800 μc

If a slab of insulating material (conceptual) 4×10^{-3} m thick is introduced between the plates of a parallel plate capacitor, the separation between the plates has to be increased by 3.5×10^{-3}m to restore the capacity to original value. The dielectric constant of the material will be

(A) 6 (B) 8 (C) 10 (D) 12

Eight drops of mercury of equal radii combine to form a big drop. The capacitance of a bigger drop as compared to each smaller drop is

(A) 2 times (B) 8 times (C) 4 times (D) 16 times

SPACE FOR ROUGH WORK

16. ಒಂದು ಲೋಲಕವು ಸರಳ ಸಂಗಂತ ಆಂದೋಲನೆ ಹೊಂದುವುದು. ಈ ಸನ್ನಿವೇಶದಲ್ಲಿ ಮಾತ್ರ.
(I) ಲೋಲಕದ ಗುಂಡಿನ ಗಾತ್ರ ಲೋಲಕದ ಉದ್ದಕ್ಕೆ ಹೋಲಿಸಿದಾಗ ನಗಣ್ಯವಾಗಿದ್ದಾಗ.
(II) ಲೋಲಕದ ಕೋನೀಯ ಪಾರ 10° ಗಿಂತ ಕಡಿಮೆ ಇದ್ದಾಗ.
(A) (I) ಮತ್ತು (II) ಎರಡೂ ಸರಿಯಾಗಿವೆ.
(B) (I) ಮತ್ತು (II) ಎರಡೂ ತಪ್ಪಾಗಿವೆ
(C) (I) ಮಾತ್ರ ಸರಿಯಾಗಿದೆ
(D) (II) ಮಾತ್ರ ಸರಿಯಾಗಿದೆ

17. ಒಂದು ವಸ್ತುವಿನ ಮೂಲಕ ನೀಳ ತರಂಗ ಮತ್ತು ವ್ಯತಸ್ತ ತರಂಗಗಳೆರಡನ್ನೂ ಪ್ರಸರಣ ಮಾಡಲು ವಸ್ತುವಿಗೆ
(A) ಗಾತ್ರ ನಿಯತಾಂಕ ಮತ್ತು ಛೇದನ ನಿಯತಾಂಕ ಎರಡೂ ಇರಬೇಕು
(B) ಗಾತ್ರ ನಿಯತಾಂಕ ಮಾತ್ರ ಇರಬೇಕು
(C) ಛೇದನ ನಿಯತಾಂಕ ಮಾತ್ರ ಇರಬೇಕು
(D) ಯಂಗನ ನಿಯತಾಂಕ ಮತ್ತು ಗಾತ್ರ ನಿಯತಾಂಕ ಎರಡೂ ಇರಬೇಕು

18. I ಉದ್ದವಿರುವ ಒಂದು ತಾಮ್ರದ ಸರಳು AB ಯನ್ನು A ತುದಿಯ ಸುತ್ತಲೂ ಸ್ಥಿರ ಕೋನೀಯ ವೇಗ ω ದೊಂದಿಗೆ ತಿರುಗಿಸಲಾಗಿದೆ. ಭ್ರಮಣ ಅಕ್ಷದಿಂದ x ದೂರದಲ್ಲಿ ವಿದ್ಯುತ್ ಕ್ಷೇತ್ರವು

(A) $\frac{m\omega^2 x}{e}$ (B) $\frac{m\omega x}{el}$ (C) $\frac{mx}{\omega^2 l}$ (D) $\frac{me}{\omega^2 x}$

19. ಏಕರೂಪವಾಗಿ ವಿದ್ಯುದಾವೇಶಿತವಾದ ಅನಂತ ಉದ್ದದ ನೇರ ತಂತಿಯಿಂದ ಉಂಟಾಗುವ ವಿದ್ಯುತ್ ಕ್ಷೇತ್ರವು ದೂರ 'r' ಜೊತೆ ಹೀಗೆ ಬದಲಾಗುತ್ತದೆ

(A) r (B) $\frac{1}{r}$ (C) $\frac{1}{r^2}$ (D) r^2

20. ಆವೇಶ Q ಅನ್ನು ಹೊಂದಿರುವ 2 ಗ್ರಾಂ ಕಾರ್ಯವು ಏಕರೂಪೀಯ ವಿದ್ಯುತ್ ಕ್ಷೇತ್ರ $\vec{E} = (300\ N\ C^{-1})\ \hat{i}$ ಪ್ರದೇಶದಲ್ಲಿ ಇದೆ. ಕಾರ್ಯವನ್ನು x = 0, ನಲ್ಲಿ ನಿಶ್ಚಲ ಸ್ಥಿತಿಯಿಂದ ಬಿಡುಗಡೆಗೊಳಿಸಿದಾಗ x = 0.5 ಮೀ ನಲ್ಲಿ 0.12 j ಚಲನಶಕ್ತಿಯನ್ನು ಹೊಂದಿದೆ. ಆಗ Q ಯು

(A) 400 μc (B) – 400 μc (C) 800 μc (D) – 800 μc

21. ಸಮಾಂತರ ಫಲಕ ಧಾರಕದ ಫಲಕಗಳ ನಡುವೆ 4×10^{-3} ಮೀ ದಪ್ಪವಿರುವ ಅವಾಹಕ ವಸ್ತುವಿನ ಚಪ್ಪಡಿಯೊಂದನ್ನು ಅಳವಡಿಸಲಾಗಿದೆ. ಧಾರಕತೆಯ ಮೂಲಬೆಲೆಯನ್ನು ಪಡೆಯಲು ಫಲಕಗಳ ನಡುವಿನ ದೂರವನ್ನು 3.5×10^{-3} ಮೀ ನಷ್ಟು ಹೆಚ್ಚಿಸಬೇಕಾಗುತ್ತದೆ. ಆ ವಸ್ತುವಿನ ಪರಾವೈದ್ಯುತ್ ಸ್ಥಿರಾಂಕವು

(A) 6 (B) 8 (C) 10 (D) 12

22. ಸಮತ್ರಿಜ್ಯವಿರುವ ಪಾದರಸದ ಎಂಟು ಹನಿಗಳು ಒಂದು ದೊಡ್ಡ ಹನಿಯಾಗಿ ರಚಿತವಾಗುತ್ತವೆ. ಪ್ರತಿಯೊಂದು ಚಿಕ್ಕ ಹನಿಯ ಧಾರಕತೆಗೆ ಹೋಲಿಸಲಾಗಿ, ದೊಡ್ಡ ಹನಿಯ ಧಾರಕತೆಯು

(A) 2 ಪಟ್ಟು (B) 8 ಪಟ್ಟು (C) 4 ಪಟ್ಟು (D) 16 ಪಟ್ಟು

SPACE FOR ROUGH WORK

23. Which of the statements is false in the case of polar molecules?

(A) Centers of positive and negative charges are separated in the absence of external electric field.

(B) Centers of positive and negative charges are separated in the presence of external electric field.

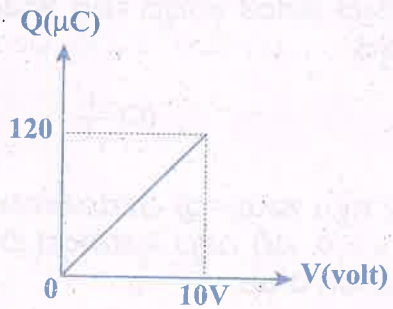
(C) Do not possess permanent dipole moments.

(D) Ionic molecule HCl is the example of polar molecule.

24. An electrician requires a capacitance of 6 μF in a circuit across a potential difference of 1.5 kV. A large number of 2 μF capacitors which can withstand a potential difference of not more than 500 V are available. The minimum number of capacitors required for the purpose is

(A) 3 (B) 9 (C) 6 (D) 27

25. In figure, charge on the capacitor is plotted against potential difference across the capacitor. The capacitance and energy stored in the capacitor are respectively.



(A) 12 μF, 1200 μJ (B) 12 μF, 600 μJ

(C) 24 μF, 600 μJ (D) 24 μF, 1200 μJ

26. A wire of resistance 3 Ω is stretched to twice its original length. The resistance of the new wire will be

(A) 1.5 Ω (B) 3 Ω (C) 6 Ω (D) 12 Ω

SPACE FOR ROUGH WORK

23. ದ್ಯುವೀಯ ಅಣುಗಳಿಗೆ ಸಂಬಂದಿಸಿದಂತೆ ಈ ಕೆಳಗಿನ ಯಾವ ಹೇಳಿಕೆ ತಪ್ಪಾಗಿದೆ ?

(A) ಬಾಹ್ಯ ವಿದ್ಯುತ್ಕ್ಷೇತ್ರದ ಅನುಪಸ್ಥಿತಿಯಲ್ಲಿ ಅಣುವಿನ ಧನಾತ್ಮಕ ಮತ್ತು ಋಣಾತ್ಮಕ ಆವೇಶ ಕೇಂದ್ರಗಳು ಬೇರ್ಪಟ್ಟಿರುತ್ತವೆ.

(B) ಬಾಹ್ಯ ವಿದ್ಯುತ್ಕ್ಷೇತ್ರದ ಉಪಸ್ಥಿತಿಯಲ್ಲಿ ಅಣುವಿನ ಧನಾತ್ಮಕ ಮತ್ತು ಋಣಾತ್ಮಕ ಆವೇಶ ಕೇಂದ್ರಗಳು ಬೇರ್ಪಟ್ಟಿರುತ್ತವೆ.

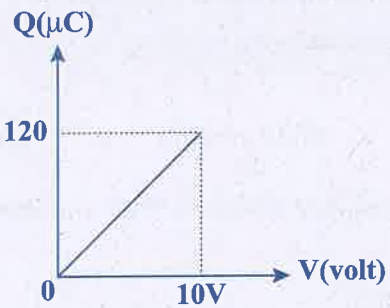
(C) ಅಣುಗಳು ಶಾಶ್ವತ ದ್ಯುವೀಯ ಮಹತ್ವ ಹೊಂದಿರುವುದಿಲ್ಲ.

(D) ಅಯಾನೀಯ ಅಣು HCl ದ್ಯುವೀಯ ಅಣುವಿಗೆ ಉದಾಹರಣೆ.

24. ಒಬ್ಬ ವಿದ್ಯುತ್ ತಂತ್ರಜ್ಞನಿಗೆ ಒಂದು 1.5 kV ವಿದ್ಯುತ್ ಜಾಲಕ್ಕೆ 6 μF ಧಾರಕತೆಯ ಅವಶ್ಯಕತೆ ಇದೆ. ಅವನ ಬಳಿ 500 V ವಿಭವಾಂತರವನ್ನು ತಡೆಯಬಲ್ಲ ಹಲವಾರು 2 μF ನ ಧಾರಕಗಳಿವೆ. ಅವನು ಎಷ್ಟು ಕಡಿಮೆ ಧಾರಕಗಳನ್ನು ಬಳಸಿ ಬೇಕಾದ ಧಾರಕತೆ ಪಡೆಯಬಹುದು ?

(A) 3 (B) 9 (C) 6 (D) 27

25. ಚಿತ್ರದಲ್ಲಿ, ಧಾರಕಕ್ಕೆ ಅಡ್ಡಲಾಗಿರುವ ವಿಭವಾಂತರಕ್ಕೆ ವಿರುದ್ಧವಾಗಿ ಧಾರಕದ ಮೇಲಿನ ಆವೇಶವನ್ನು ರೂಪಿಸಿರುವುದನ್ನು ತೋರಿಸಲಾಗಿದೆ. ಕ್ರಮವಾಗಿ ಧಾರಕತೆ ಮತ್ತು ಧಾರಕದಲ್ಲಿ ಸಂಗ್ರಹವಾದ ಶಕ್ತಿ



(A) 12 μF, 1200 μJ (B) 12 μF, 600 μJ

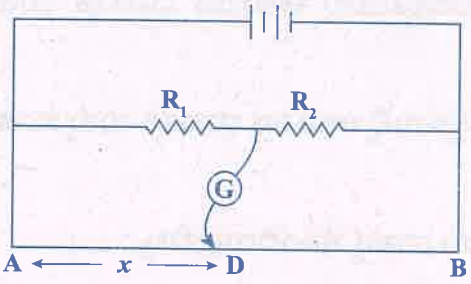
(C) 24 μF, 600 μJ (D) 24 μF, 1200 μJ

26. 3 Ω ರೋಧವುಳ್ಳ ತಂತಿಯನ್ನು ಅದರ ಮೂಲ ಉದ್ದದ ಎರಡರಷ್ಟು ಹಿಗ್ಗಿಸಲಾಗಿದೆ. ಹೊಸ ತಂತಿಯ ರೋಧವು

(A) 1.5 Ω (B) 3 Ω (C) 6 Ω (D) 12 Ω

SPACE FOR ROUGH WORK

27. In the given arrangement of experiment on metre bridge, if AD corresponding to null deflection of the galvanometer is X, what would be its value if the radius of the wire AB is doubled?



(A) X (B) $\frac{X}{4}$ (C) 4 X (D) 2 X

28. A copper wire of length 1 m and uniform crosssectional area 5×10^{-7} m^2 carries a current of 1A. Assuming that there are 8×10^{28} free electrons per m^3 in copper, how long will an electron take to drift from one end of the wire to the other?

(A) 0.8×10^3 S (B) 1.6×10^3 S (C) 3.2×10^3 S (D) 6.4×10^3 S

29. Consider an electrical conductor connected across a potential difference V. Let Δq be a small charge moving through it in time Δt. If I is the electric current through it,

(I) the kinetic energy of the charge increases by $IV\Delta t$.

(II) the electric potential energy of the charge decreases by $IV\Delta t$.

(III) the thermal energy of the conductor increases by $IV\Delta t$.

Then the correct statement/s is / are

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

30. A strong magnetic field is applied on a stationary electron. Then the electron

(A) Moves in the direction of the field

(B) Moves in an opposite direction of the field

(C) Remains stationary

(D) Starts spinning

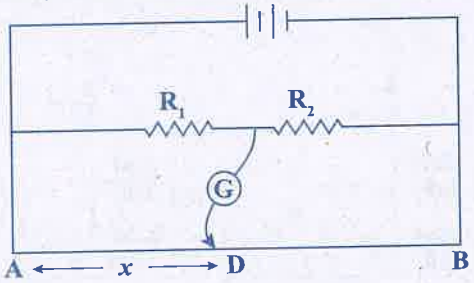
31. Two parallel wires in free space are 10 cm apart and each carries a current of 10A in the same direction. The force exerted by one wire on the other [per unit length] is

(A) 2×10^{-4} Nm^{-1} [attractive] (B) 2×10^{-7} Nm^{-1} [attractive]

(C) 2×10^{-4} Nm^{-1} [repulsive] (D) 2×10^{-7} Nm^{-1} [repulsive]

SPACE FOR ROUGH WORK

27. ಕೊಟ್ಟಿರುವ ಮೀಟರ್ ಬ್ರಿಡ್ಜ್ ಪ್ರಯೋಗದ ಜೋಡಣೆಯಲ್ಲಿ ಗ್ಯಾಲ್ವನೋ ಮಾಪಕದ ಶೂನ್ಯಕ್ಕೆ ಅನುಗುಣವಾ AD ಗೆ X ಆದರೆ AB ತಂತಿಯ ತ್ರಿಜ್ಯವನ್ನು ದ್ವಿಗುಣಗೊಳಿಸಿದಾಗ ಅದರ ಬೆಲೆ ಎಷ್ಟು ?



(A) X (B) $\frac{X}{4}$ (C) 4 X (D) 2 X

28. 5×10^{-7} m^2 ನಿಯತ ಅಡ್ಡ ಕೊಯ್ತ ವಿಸ್ತೀರ್ಣ ಮತ್ತು 1 m ಉದ್ದವಿರುವ ಒಂದು ತಾಮ್ರದ ತಂತಿಯು, 1A ವಿದ್ಯು ಪ್ರವಾಹವನ್ನು ಹೊಂದಿದೆ. ತಾಮ್ರದ ಒಂದು ಘನ ಮೀಟರ್ ನಲ್ಲಿ 8×10^{28}, ಸ್ವತಂತ್ರ ಎಲೆಕ್ಟ್ರಾನ್ ಗಳಿವೆಯೆಂ ಭಾವಿಸಿಕೊಂಡಾಗ ಎಲೆಕ್ಟ್ರಾನ್ ವೊಂದನ್ನು ತಂತಿಯ ಒಂದು ತುದಿಯಿಂದ ಮತ್ತೊಂದು ತುದಿಗೆ ಎಳೆಯ ಬೇಕಾಗುವ ಸಮಯವೆಷ್ಟು?

(A) 0.8×10^3 S (B) 1.6×10^3 S (C) 3.2×10^3 S (D) 6.4×10^3 S

29. ವಿದ್ಯುದ್ವಿಭವಾಂತರ V ಅಡ್ಡಲಾಗಿ ಜೋಡಿಸಿರುವ ವಿದ್ಯುತ್ಪಾತ ವೊಂದನ್ನು ಪರಿಗಣಿಸಿ. ಅದರ ಮೂ Δt. ಕಾಲಾಂತರದಲ್ಲಿ ಹಾದುಹೋಗುವ ಆವೇಶ Δq ಆಗಿರಲಿ. ವಾಹಕದೊಳಗೆ ಹಾದುಹೋಗುವ ಪ್ರವಾ ಆಗಿದ್ದಾಗ :

(I) ಆವೇಶದ ಚಲನೆ ಶಕ್ತಿ $IV\Delta t$ ಯಷ್ಟು ಹೆಚ್ಚಾಗುತ್ತದೆ.

(II) ಆವೇಶದ ವಿದ್ಯುತಪ್ರಚ್ಛನ್ನ ಶಕ್ತಿ $IV\Delta t$ ಯಷ್ಟು ಕಡಿಮೆಯಾಗುತ್ತದೆ.

(III) ವಾಹಕದ ಉಷ್ಣ ಶಕ್ತಿ $IV\Delta t$ ಯಷ್ಟು ಕಡಿಮೆಯಾಗುತ್ತದೆ.

ಈ ಮೇಲ್ಕಂಡ ಹೇಳಿಕೆಗಳಲ್ಲಿ ಸರಿಯಾಗಿರುವ ಹೇಳಿಕೆ /ಹೇಳಿಕೆಗಳು

(A) (I) (B) (I), (II) (C) (I) ಮತ್ತು (III) (D) (II), (III)

30. ಒಂದು ತೀವ್ರ ಕಾಂತಕ್ಷೇತ್ರವನ್ನು ನಿಶ್ಚಲ ಎಲೆಕ್ಟ್ರಾನ್ ನ ಮೇಲೆ ಪ್ರಯೋಗಿಸಿದಾಗ, ಆ ಎಲೆಕ್ಟ್ರಾನ್

(A) ಕ್ಷೇತ್ರದ ದಿಕ್ಕಿನಲ್ಲಿ ಚಲಿಸುವುದು (B) ಕ್ಷೇತ್ರದ ವಿರುದ್ಧ ದಿಕ್ಕಿನಲ್ಲಿ ಚಲಿಸುವುದು

(C) ನಿಶ್ಚಲ ಸ್ಥಿತಿಯಲ್ಲಿರುವುದು (D) ತಿರುಗಲು ಪ್ರಾರಂಭಿಸುವುದು

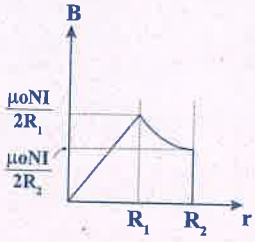
31. ಒಂದೇ ದಿಕ್ಕಿನಲ್ಲಿ 10A ವಿದ್ಯುತ್ ಪ್ರವಹಿಸುತ್ತಿರುವ ಎರಡು ಸಮಾಂತರ ತಂತಿಗಳು ನಿರ್ವಾತದಲ್ಲಿ 10 cm ಅಂತರದಲ್ಲಿ ಒಂದು ತಂತಿಯು ಇನ್ನೊಂದರ ಮೇಲೆ ಪ್ರಯೋಗಿಸುವ ಬಲ [ಏಕಮಾನ ಉದ್ದದ ಮೇಲೆ]

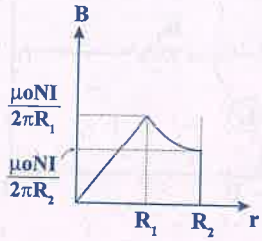
(A) 2×10^{-4} Nm^{-1} [ಆಕರ್ಷಣ] (B) 2×10^{-7} Nm^{-1} [ಆಕರ್ಷಣ]

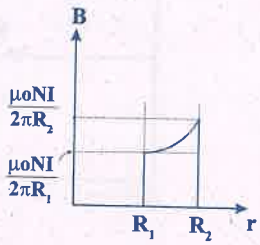
(C) 2×10^{-4} Nm^{-1} [ವಿಕರ್ಷಣ] (D) 2×10^{-7} Nm^{-1} [ವಿಕರ್ಷಣ]

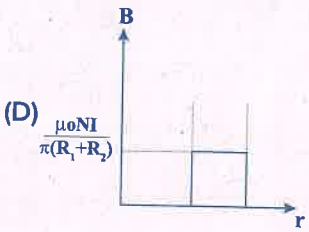
SPACE FOR ROUGH WORK

A toroid with thick windings of N turns has inner and outer radii R_1 and R_2 respectively. If it carries certain steady current I, the variation of the magnetic field due to the toroid with radial distance is correctly graphed in

(A) 

(B) 

(C) 

(D) 

A tightly wound long solenoid has 'n' turns per unit length, a radius 'r' and carries a current I. A particle having charge 'q' and mass 'm' is projected from a point on the axis in a direction perpendicular to the axis. The maximum speed of the particle for which the particle does not strike the solenoid is

(A) $\frac{\mu_o nlqr}{m}$ (B) $\frac{\mu_o nlqr}{2m}$ (C) $\frac{\mu_o nlqr}{4m}$ (D) $\frac{\mu_o nlqr}{8m}$

Earth's magnetic field always has a horizontal component except at

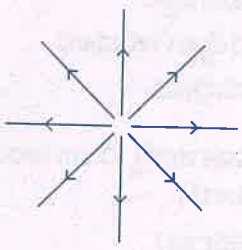
(A) equator

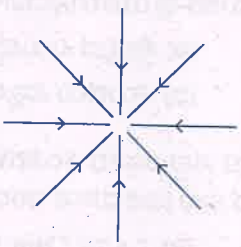
(B) magnetic poles

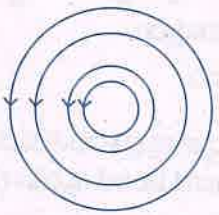
(C) a latitude of 60°

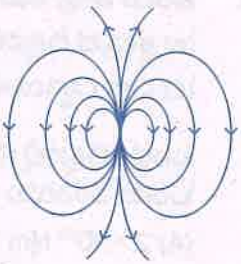
(D) an altitude of 60°

Which of the field pattern given below is valid for electric field as well as for magnetic field?

(A) 

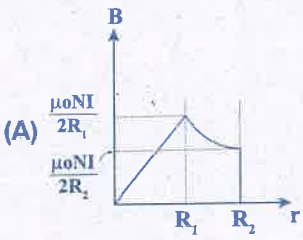
(B) 

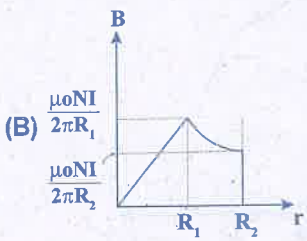
(C) 

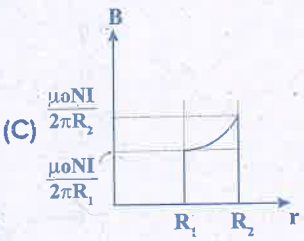
(D) 

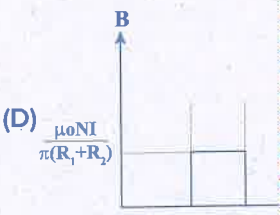
SPACE FOR ROUGH WORK

32. N ಸುತ್ತುಗಳಿಂದ ದಟ್ಟವಾಗಿ ಹೊಸೆದಿರುವ ಸುರುಳಿ ಬಳೆಯ ಆಂತರಿಕ ಮತ್ತು ಬಾಹ್ಯ ತ್ರಿಜ್ಯಗಳು ಕ್ರಮವಾ R_1 ಮತ್ತು R_2 ಆಗಿವೆ. ಅದರ ತಂತಿಯಲ್ಲಿ ಸ್ಥಿರ ವಿದ್ಯುತ್ I ಪ್ರವಹಿಸುತ್ತಿದ್ದರೆ , ತ್ರಿಜ್ಯ ದೂರದೊಂದಿಗೆ ಬಳೆಯಿಂ ಉಂಟಾಗುವ ಕಾಂತಕ್ಷೇತ್ರ ಬದಲಾಗುವ ಗ್ರಾಫ್ ನಕ್ಷೆಯು ಇಂತಿರುತ್ತದೆ.

(A) 

(B) 

(C) 

(D) 

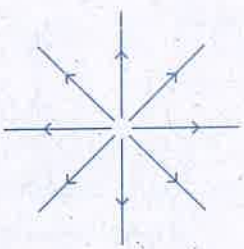
33. ಒಂದು ದಟ್ಟವಾಗಿ ಸುತ್ತಿದ ಪ್ರತಿ ಮೀಟರ್ ನಲ್ಲಿ 'n' ಸುತ್ತುಗಳಿರುವ, ತ್ರಿಜ್ಯ 'r' ಇರುವ ಸೊಲೆನಾಯಿಡ್ ನಲ್ಲಿ ಸ್ಥಿ ವಿದ್ಯುತ್ ಪ್ರವಾಹವು I ಆಗಿರುತ್ತದೆ. ಆವೇಶ 'q' ಇದ್ದು ರಾಶಿ 'm' ಇರುವ ಕಣವನ್ನು ಸೊಲೆನಾಯಿಡ್ ನ ಅಕ್ಷ ಲಂಬಿಕವಾಗಿ , ಅದರ ಅಕ್ಷ ಬಿಂದುವಿನಿಂದ ಜಿಮ್ಮಿಸಲಾಗಿದೆ. ಕಣವು ಸೊಲೆನಾಯಿಡ್ ನ್ನು ಸ್ಪರ್ಶಿಸದಿರಲು ಕಣ ಕೊಟ್ಟ ಗರಿಷ್ಟ ಜವವು.

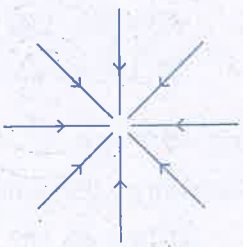
(A) $\frac{\mu_0 nlqr}{m}$ (B) $\frac{\mu_0 nlqr}{2m}$ (C) $\frac{\mu_0 nlqr}{4m}$ (D) $\frac{\mu_0 nlqr}{8m}$

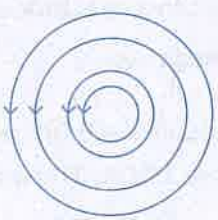
34. ಭೂ ಕಾಂತ ಕ್ಷೇತ್ರವು ---------- ನಲ್ಲಿ ಬಿಟ್ಟು ಎಲ್ಲೆಡೆ ಅಡ್ಡ ಅಂಗವನ್ನು ಹೊಂದಿರುತ್ತದೆ.

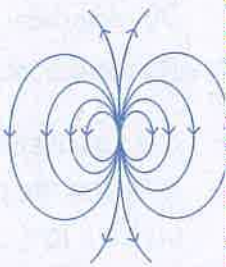
(A) ಭೂಮಧ್ಯ ರೇಖೆ
(B) ಕಾಂತೀಯ ದ್ರುವಗಳು
(C) 60°ಅಕ್ಷಾಂಶ
(D) 60° ರೇಖಾಂಶ

35. ಕೆಳಗೆ ಕೊಟ್ಟಿರುವ ಕ್ಷೇತ್ರ ಮಾದರಿಗಳಲ್ಲಿ ಯಾವುದನ್ನು ವಿದ್ಯುತ್ ಕ್ಷೇತ್ರ ಹಾಗೆಯೇ ಕಾಂತ ಕ್ಷೇತ್ರಗಳಿಗಾಗಿ ಮಾ ಮಾಡಬಹುದು ?

(A) 

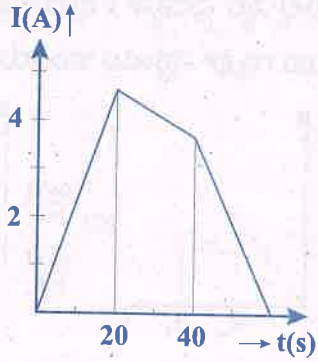
(B) 

(C) 

(D) 

SPACE FOR ROUGH WORK

5. The current flowing through an inductance coil of self inductance 6 mH at different time instants is as shown. The emf induced between t = 20s and t = 40s is nearly

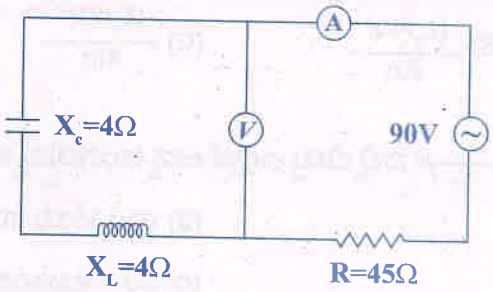


(A) 2×10^{-2} V (B) 3×10^{-2} V (C) 4×10^{-3} V (D) 30×10^{2} V

. The physical quantity which is measured in the unit of wb A^{-1} is

(A) Self inductance (B) Mutual inductance (C) Magnetic flux (D) Both (A) and (B)

. What will be the reading in the voltmeter and ammeter of the circuit shown?



(A) 90V, 2A (B) 0V, 2A (C) 90V, 1A (D) 0V, 1A

LC osillations are similar and analogous to the mechanical oscillations of a block attached to a spring. The electrical equivalent of the force constant of the spring is

(A) reciprocal of capacitive reactance (B) capacitive reactance

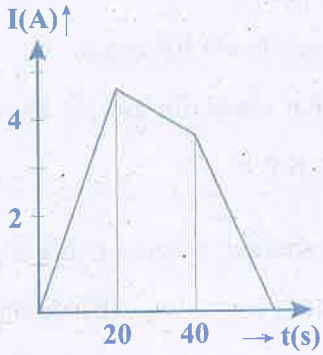
(C) reciprocal of capacitance (D) capacitance

In an oscillating LC circuit, L = 3.00 mH and C = 2.70 μF. At t = 0 the charge on the capacitor is zero and the current is 2.00A. The maximum charge that will appear on the capacitor will be:

(A) 1.8×10^{-5} C (B) 18×10^{-5} C (C) 9×10^{-5} C (D) 90×10^{-5} C

SPACE FOR ROUGH WORK

36. ವಿವಿಧ ಕಾಲಕ್ಷಣದಲ್ಲಿ ಸ್ವಪ್ರೇರಕತೆ 6 mH ಇರುವ ಪ್ರೇರಕ ಸುರುಳಿಯಲ್ಲಿ ಹಾಯುವ ವಿದ್ಯುತ್ ನ ಗ್ರಾಫ್ ನಕ್ಷೆಯನ್ನು ಕೆಳಗೆ ತೋರಿಸಲಾಗಿದೆ. ಕಾಲಾಂತರ t = 20s ನಿಂದ t = 40s ನಲ್ಲಿ ಸುರುಳಿಯಲ್ಲಿ ಉಂಟಾಗುವ ಪ್ರೇರಿತ ವಿ. ಚಾ. ಬ. ವು



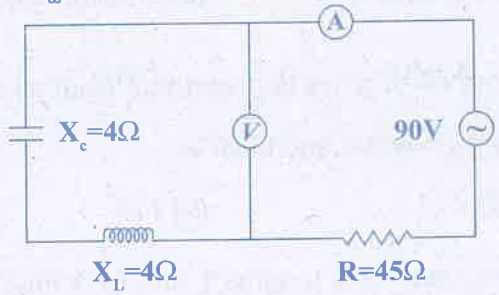
(A) 2×10^{-2} V (B) 3×10^{-2} V (C) 4×10^{-3} V (D) 30×10^{2} V

37. ಯಾವ ಭೌತಿಕ ಪರಿಮಾಣದ ಮೂಲಮಾನ wb A^{-1} ಆಗಿದೆ ?

(A) ಸ್ವಪ್ರೇರಕತೆ (B) ಪರಸ್ಪರ ಪ್ರೇರಕತೆ

(C) ಕಾಂತೀಯ ಅಭಿವಾಹ (D) (A) ಮತ್ತು (B) ಎರಡೂ

38. ತೋರಿಸಿದ ಮಂಡಲದಲ್ಲಿ ವೋಲ್ಟ್ ಮೀಟರ್ ಮತ್ತು ಆಮ್ಮೀಟರ್ ನಲ್ಲಿ ಮಾಪನ ಬೆಲೆಗಳೆಷ್ಟು ?



(A) 90V, 2A (B) 0V, 2A (C) 90V, 1A (D) 0V, 1A

39. LC ಆಂದೋಲನಗಳು ಸ್ಪ್ರಿಂಗ್ ಗೆ ಜೋಡಿಸಿದ ಮರದ ತುಂಡಿನ ಆಂದೋಲನಕ್ಕೆ ಸಾದೃಶವೂ ಸಾಮ್ಯವೂ ಆಗಿವೆ. ಸ್ಪ್ರಿಂಗ್ ನ ಬಲ ಸ್ಥಿರಾಂಕಕ್ಕೆ ತತ್ಸಮಾನವಾದ ವಿದ್ಯುದೀಯ ಪರಿಮಾಣವು

(A) ಧಾರಕೀಯ ಪ್ರತಿಘಾತದ ವಿಲೋಮವು (B) ಧಾರಕೀಯ ಪ್ರತಿಘಾತವು

(C) ಧಾರಕತೆಯ ವಿಲೋಮವು (D) ಧಾರಕತೆಯು

40. ಆಂದೋಲನದಲ್ಲಿರುವ LC ಮಂಡಲದಲ್ಲಿ L = 3.00 mH ಮತ್ತು C = 2.70 μF. t = 0 ನಲ್ಲಿ ಧಾರಕದ ಮೇಲಿನ ಆವೇಶವು ಸೊನ್ನೆ ಹಾಗು ಪ್ರವಾಹವು 2.00A. ಆಗಿದೆ. ಆಗ ಧಾರಕದ ಮೇಲೆ ಕಾಣಿಸಲ್ಪಡುವ ಗರಿಷ್ಟ ಆವೇಶವು

(A) 1.8×10^{-5} C (B) 18×10^{-5} C (C) 9×10^{-5} C (D) 90×10^{-5} C

SPACE FOR ROUGH WORK

41. Suppose that the electric field amplitude of electromagnetic wave is $E_o = 120\ NC^{-1}$ and its frequency is f = 50 MHz. Then which of the following value is incorrectly computed?

(A) Magnetic field amplitude is 400nT.

(B) Angular frequency of EM wave is $\pi \times 10^8$ rad/s

(C) Propagation constant (angular wave number) is 2.1 rad/m

(D) Wavelength of the EM wave is 6 m.

42. The source of electromagnetic waves can be a charge.

(A) Moving with a constant velocity

(B) Moving in a circular orbit.

(C) At rest

(D) Moving parallel to the magnetic field

43. In refraction, light waves are bent on passing from one medium to second medium because, in the second medium.

(A) frequency is different

(B) speed is different

(C) coefficient of elasticity is different

(D) amplitude is smaller.

44. If the refractive index from air to glass is $\frac{3}{2}$ and that from air to water is $\frac{4}{3}$, then the ratio of focal lengths of a glass lens in water and in air is

(A) 1 : 2 (B) 2 : 1 (C) 1 : 4 (D) 4 : 1

45. Two thin biconvex lenses have focal lengths f_1 and f_2. A third thin biconcave lens has focal length of f_3. If the two biconvex lenses are in contact, the total power of the lenses is P_1. If the first convex lens is in contact with the third lens, the total power is P_2. If the second lens is in contact with the third lens, the total power is P_3 then

(A) $P_1 = \frac{f_1 f_2}{f_1 - f_2}$, $P_2 = \frac{f_1 f_3}{f_3 - f_1}$ and $P_3 = \frac{f_2 f_3}{f_3 - f_2}$ (B) $P_1 = \frac{f_1 - f_2}{f_1 f_2}$, $P_2 = \frac{f_3 - f_1}{f_3 + f_1}$ and $P_3 = \frac{f_3 - f_2}{f_2 f_3}$

(C) $P_1 = \frac{f_1 - f_2}{f_1 f_2}$, $P_2 = \frac{f_3 - f_1}{f_1 f_3}$ and $P_3 = \frac{f_3 - f_2}{f_2 f_3}$ (D) $P_1 = \frac{f_1 + f_2}{f_1 f_2}$, $P_2 = \frac{f_3 - f_1}{f_1 f_3}$ and $P_3 = \frac{f_3 - f_2}{f_2 f_3}$

SPACE FOR ROUGH WORK

41. ಒಂದು ವಿದ್ಯುತ್ಕಾಂತೀಯ ಅಲೆಯ ವಿದ್ಯುತ್ಕ್ಷೇತ್ರ ಪಾರವು $E_0 = 120\ NC^{-1}$ ಆಗಿದೆ ಎಂದಿಟ್ಟುಕೊಳ್ಳಿ, ಮತ್ತು ಅದರ ಆವರ್ತ ಸಂಖ್ಯೆಯು f = 50 MHz. ಆಗಿರಲಿ. ಹಾಗಾದರೆ ಕೆಳಗಿನ ಯಾವ ಪರಿಮಾಣದ ಮೌಲ್ಯವನ್ನು ತಪ್ಪಾಗಿ ಲೆಕ್ಕ ಹಾಕಲಾಗಿದೆ ?

(A) ಕಾಂತ ಕ್ಷೇತ್ರದ ಪಾರವು 400nT ಆಗಿದೆ.

(B) ವಿದ್ಯುತ್ಕಾಂತೀಯ ಅಲೆಯ ಕಾಂತ ಕ್ಷೇತ್ರದ ಪಾರವು $\pi \times 10^8$ rad/s ಆಗಿದೆ

(C) ಪ್ರಸರಣ ಸ್ಥಿರಾಂಕ (ಕೋನೀಯ ತರಂಗ ಸಂಖ್ಯೆ) 2.1 rad/m ಆಗಿದೆ.

(D) ವಿದ್ಯುತ್ಕಾಂತೀಯ ಅಲೆಯ ತರಂಗಾಂತರವು 6 m ಆಗಿದೆ.

42. ವಿದ್ಯುತ್ಕಾಂತೀಯ ತರಂಗಗಳ ಆಕರ, ಆವೇಶ

(A) ಏಕರೂಪ ಚಲನೆ ಹೊಂದಿರುವುದು

(B) ವೃತ್ತಾಕಾರದಲ್ಲಿ ಚಲಿಸುತ್ತಿರುವುದು.

(C) ನಿಶ್ಚಲವಾಗುವುದು

(D) ಕಾಂತ ಕ್ಷೇತ್ರಕ್ಕೆ ಸಮಾನಾಂತವಾಗಿ ಚಲಿಸುತ್ತಿರುವುದು

43. ವಕ್ರೀ ಭವನದಲ್ಲಿ, ಒಂದು ಮಾಧ್ಯಮದಿಂದ ಇನ್ನೊಂದು ಮಾಧ್ಯಮಕ್ಕೆ ಹರಿಯುವ ಬೆಳಕಿನ ಅಲೆ ಭಾಗುವುದು. ಏಕೆಂದರೆ ಎರಡನೇ ಮಾಧ್ಯಮದಲ್ಲಿ

(A) ಆವೃತ್ತಿ ಬೇರೆಯಾಗುತ್ತದೆ (B) ಜವ ಬೇರೆಯಾಗುತ್ತದೆ

(C) ಸ್ಥಿತಿ ಸ್ಥಾಪಕ ಸಹಾಂಕ ಬೇರೆಯಾಗುತ್ತದೆ (D) ಪಾರವು ಕಡಿಮೆ

44. ಗಾಳಿಯಿಂದ ಗಾಜಿಗೆ ವಕ್ರೀಭವನಾಂಕ $\frac{3}{2}$ ಮತ್ತು ಗಾಳಿಯಿಂದ ನೀರಿಗೆ ಅದು $\frac{4}{3}$, ಆದರೆ, ನೀರಿನಲ್ಲಿ ಮತ್ತು ಗಾಳಿಯಲ್ಲಿ ಒಂದು ಗಾಜಿನ ಮಸೂರದ ಸಂಗಮ ದೂರದ ಅನುಪಾತವು

(A) 1 : 2 (B) 2 : 1 (C) 1 : 4 (D) 4 : 1

45. ಎರಡು ತೆಳು ಪೀನ ಮಸೂರಗಳ ಸಂಗಮ ದೂರಗಳು ಕ್ರಮವಾಗಿ f_1 ಮತ್ತು f_2 ಆಗಿವೆ, ಮೂರನೆಯತೆಳು ನಿಮ್ನ ಮಸೂರದ ಸಂಗಮ ದೂರ f_3 ಆಗಿದೆ. ಎರಡು ಪೀನ ಮಸೂರಗಳು ಸ್ಪರ್ಷದಲ್ಲಿದ್ದರೆ ಅವುಗಳ ಒಟ್ಟು ದ್ಯುತಿ ಸಾಮರ್ಥ್ಯ P_1 ಆಗಿರುತ್ತದೆ. ಮೊದಲನೆಯ ಮಸೂರ ಮೂರನೇ ಮಸೂರದೊಂದಿಗೆ ಸ್ಪರ್ಷದಲ್ಲಿದ್ದರೆ ಅವುಗಳ ಒಟ್ಟು ದ್ಯುತಿ ಸಾಮರ್ಥ್ಯ P_2 ಆಗಿರುತ್ತದೆ. ಎರಡನೆಯ ಮಸೂರವು ಮೂರನೇ ಮಸೂರದೊಂದಿಗೆ ಸ್ಪರ್ಷದಲ್ಲಿದ್ದರೆ ಅವುಗಳ ಒಟ್ಟು ದ್ಯುತಿ ಸಾಮರ್ಥ್ಯ P_3 ಆಗಿರುತ್ತದೆ.

(A) $P_1 = \frac{f_1 f_2}{f_1 - f_2}$, $P_2 = \frac{f_1 f_3}{f_3 - f_1}$ and $P_3 = \frac{f_2 f_3}{f_3 - f_2}$ (B) $P_1 = \frac{f_1 - f_2}{f_1 f_2}$, $P_2 = \frac{f_3 - f_1}{f_3 + f_1}$ and $P_3 = \frac{f_3 - f_2}{f_2 f_3}$

(C) $P_1 = \frac{f_1 - f_2}{f_1 f_2}$, $P_2 = \frac{f_3 - f_1}{f_1 f_3}$ and $P_3 = \frac{f_3 - f_2}{f_2 f_3}$ (D) $P_1 = \frac{f_1 + f_2}{f_1 f_2}$, $P_2 = \frac{f_3 - f_1}{f_1 f_3}$ and $P_3 = \frac{f_3 - f_2}{f_2 f_3}$

SPACE FOR ROUGH WORK

46. The size of the image of an object, which is at infinity, as formed by a convex lens of focal length 30 cm is 2 cm. If a concave lens of focal length 20 cm is placed between the convex lens and the image at a distance of 26 cm from the lens, the new size of the image is:

(A) 1.25 cm
(B) 2.5 cm
(C) 1.05 cm
(D) 2 cm

47. A slit of width 'a' is illuminated by red light of wavelength 6500A°. If the first diffraction minimum falls at 30°, then the value of 'a' is _____

(A) 6.5×10^{-4} mm
(B) 1.3 micron
(C) 3250 A°
(D) 2.6×10^{-4} cm

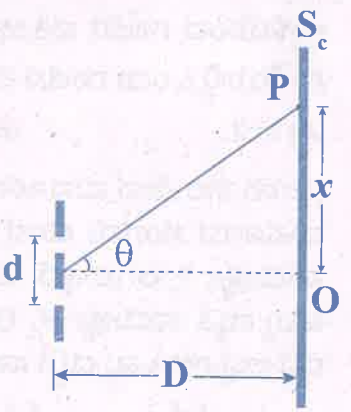
48. Which of the statements are correct with reference to single slit diffraction pattern?

(i) Fringes are of unequal width
(ii) Fringes are of equal width
(iii) Light energy is conserved
(iv) Intensities of all bright fringes are equal

(A) (i) and (iii)
(B) (i) and (iv)
(C) (ii) and (iv)
(D) (ii) and (iii)

49. In the Young's double slit experiment a monochromatic source of wavelength λ is used. The intensity of light passing through each slit is I_o. The intensity of light reaching the screen S_c at a point P, a distance x from O is given by (Take $d << D$).

(A) $I_o \cos^2\left(\frac{\pi D}{\lambda d} x\right)$
(B) $4I_o \cos^2\left(\frac{\pi d}{\lambda D} x\right)$
(C) $I_o \sin^2\left(\frac{\pi d}{2\lambda D} x\right)$
(D) $4I_o \cos\left(\frac{\pi d}{2\lambda D} x\right)$



SPACE FOR ROUGH WORK

46. ಸಂಗಮ ದೂರ 30 ಸೆಂ ಮೀ ಹೊಂದಿರುವ ಪೀನ ಮಸೂರದಿಂದ ಅನಂತ ದೂರದಲ್ಲಿರುವ ವಸ್ತುವಿನ ಬಿಂಬದ ಗಾತ್ರವು 2 ಸೆಂ ಮೀ ಇದೆ. 20 ಸೆಂ ಮೀ ಸಂಗಮ ದೂರ ಹೊಂದಿರುವ ನಿಮ್ನ ಮಸೂರವನ್ನು ಪೀನ ಮಸೂರ ಮತ್ತು ಮಸೂರದಿಂದ 26 ಸೆಂ. ಮೀ. ದೂರದಲ್ಲಿ ಉಂಟಾದ ಬಿಂಬದ ಮಧ್ಯೆ ಇಟ್ಟಾಗ, ಬಿಂಬದ ಗಾತ್ರವು

(A) 1.25 ಸೆಂ ಮೀ. (B) 2.5 ಸೆಂ ಮೀ (C) 1.05 ಸೆಂ ಮೀ (D) 2 ಸೆಂ ಮೀ

47. $6500A^{\circ}$ ತರಂಗ ದೂರವುಳ್ಳ ಕೆಂಪು ಬೆಳಕಿನಿಂದ 'a' ಅಗಲವುಳ್ಳ ಒಂದು ರಂಧ್ರವನ್ನು ಬೆಳಗಿಸಲಾಗಿದೆ. ಮೊದಲ ವಿವರ್ತನ ಕನಿಷ್ಟವು 30° ಯಲ್ಲಿ ಬಿದ್ದರೆ, 'a' ನ ಬೆಲೆ

(A) 6.5×10^{-4} mm (B) 1.3 micron

(C) $3250\ A^{\circ}$ (D) 2.6×10^{-4} cm

48. ಏಕ ಸೀಳು ಗಂಡಿ ವಿವರ್ತನೆ ಪಟ್ಟಿ ವಿನ್ಯಾಸಕ್ಕೆ ಸಂಬಂಧ ಪಟ್ಟಂತೆ ಸರಿಯಾದ ಹೇಳಿಕೆಗಳು ಯಾವುವು ?

(i) ಎಲ್ಲಾ ಪಟ್ಟಿಗಳ ಅಗಲವು ಭಿನ್ನವಾಗಿರುವುದು.

(ii) ಎಲ್ಲಾ ಪಟ್ಟಿಗಳ ಆಗಲವು ಒಂದೇ ಆಗಿರುವುದು.

(iii) ಬೆಳಕಿನ ಶಕ್ತಿ ಸಂರಕ್ಷಿತವಾಗಿರುವುದು.

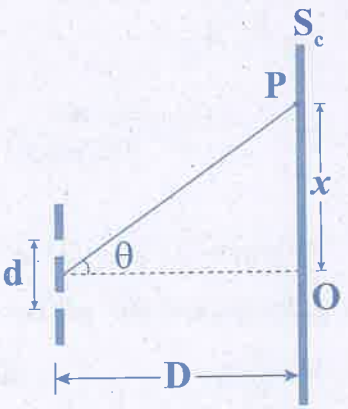
(iv) ಎಲ್ಲಾ ಶ್ವೇತ ಪಟ್ಟಿಗಳ ತೀವ್ರತೆ ಸಮನಾಗಿರುವುದು.

(A) (i) ಮತ್ತು (iii) (B) (i) ಮತ್ತು (iv) (C) (ii) ಮತ್ತು (iv) (D) (ii) ಮತ್ತು (iii)

49. ಯಂಗನ ದ್ವಿನೇಳುಗಂಡಿ ಪ್ರಯೋಗದಲ್ಲಿ λ ತರಂಗಾಂತರ ಇರುವ ಏಕವರ್ಣೀಯ ಬೆಳಕಿನ ಆಕರವನ್ನು ಉಪಯೋಗಿಸಲಾಗಿದೆ. ಪ್ರತಿ ಸೀಳುಗಂಡಿಯಿಂದ ಹೊಮ್ಮುವ ಬೆಳಕಿನ ತೀವ್ರತೆ I_0 ಆಗಿದೆ. ಪರದೆಯ S_cಯ ಮೇಲಿನ ಬಿಂದು P, ಆಗಿದ್ದು O ನಿಂದ x ದೂರದಲ್ಲಿದ್ದರೆ ಅಲ್ಲಿ ಉಂಟಾಗುವ ಬೆಳಕಿನ ತೀವ್ರತೆಯು ($d << D$ ಎಂದು ಭಾವಿಸಿ).

(A) $I_0 \cos^2\left(\frac{\pi D}{\lambda d} x\right)$ (B) $4I_0 \cos^2\left(\frac{\pi d}{\lambda D} x\right)$

(C) $I_0 \sin^2\left(\frac{\pi d}{2\lambda D} x\right)$ (D) $4I_0 \cos\left(\frac{\pi d}{2\lambda D} x\right)$



SPACE FOR ROUGH WORK

50. The work function of a metal is 1eV. Light of wavelength 3000A° is incident on this metal surface. The velocity of emitted photoelectrons will be

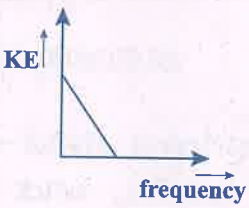
(A) 10 ms^{-1} (B) 1×10^3 ms^{-1}

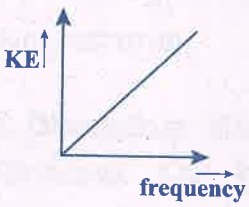
(C) 1×10^4 ms^{-1} (D) 1×10^6 ms^{-1}

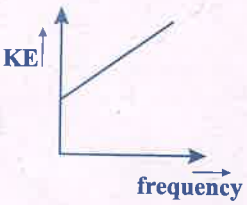
51. A proton moving with a momentum P_1 has a kinetic energy $\frac{1}{8}$th of its rest mass energy. Another light photon having energy equal to the kinetic energy of the proton possesses a momentum P_2. Then the ratio $\frac{P_1 - P_2}{P_1}$ is equal to

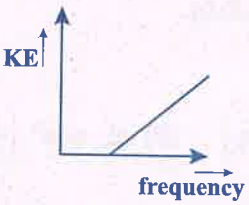
(A) 1 (B) $\frac{1}{4}$ (C) $\frac{1}{2}$ (D) $\frac{3}{4}$

52. According to Einstein's photoelectric equation the graph between kinetic energy of photoelectrons ejected and the frequency of incident radiation is

(A) 

(B) 

(C) 

(D) 

53. Energy of an electron in the second orbit of hydrogen atom is E_2. The energy of electron in the third orbit of He^+ will be

(A) $\frac{9}{16} E_2$ (B) $\frac{16}{9} E_2$ (C) $\frac{3}{16} E_2$ (D) $\frac{16}{3} E_2$

SPACE FOR ROUGH WORK

50. ಒಂದು ಲೋಹದ ಕಾರ್ಯಫಲನ 1eV ಆಗಿದೆ. 3000A° ತರಂಗ ದೂರವುಳ್ಳ ಬೆಳಕನ್ನು ಲೋಹದ ಮೇಲೆ ಬೀಳಿಸಲಾಗಿದೆ. ಉತ್ಸರ್ಜಿತ ದ್ಯುತಿ ಎಲೆಕ್ಟ್ರಾನ್ ವೇಗವು

(A) $10\ ms^{-1}$ (B) $1 \times 10^3\ ms^{-1}$

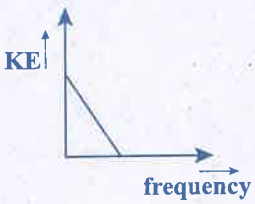
(C) $1 \times 10^4\ ms^{-1}$ (D) $1 \times 10^6\ ms^{-1}$

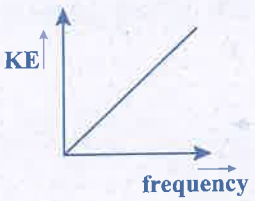
51. ಒಂದು ಚಲಿಸುತ್ತಿರುವ ಪ್ರೋಟಾನಿಗೆ ಅದರ ನಿಶ್ಚಲ ರಾಶಿಶಕ್ತಿ $\frac{1}{8}$ ರಷ್ಟು ಚಲನಶಕ್ತಿ ಇದ್ದು ಅದರ ಸಂವೇಗವು P_1 ಆಗಿದೆ. ಇನ್ನೊಂದು ಬೆಳಕಿನ ಫೋಟಾನು ಪ್ರೋಟಾನಿನ ಚಲನ ಶಕ್ತಿಯಷ್ಟೆ ಶಕ್ತಿ ಹೊಂದಿದ್ದು ಸಂವೇಗ P_2 ಹೊಂದಿದೆ. ಹಾಗಾದರೆ ಅನುಪಾತ $\frac{P_1 - P_2}{P_1}$ ಇಷ್ಟಾಗಿರುವುದು.

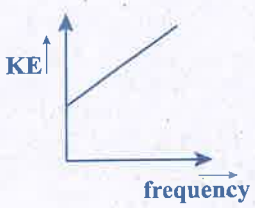
(A) 1 (B) $\frac{1}{4}$

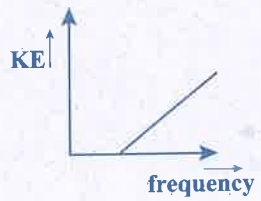
(C) $\frac{1}{2}$ (D) $\frac{3}{4}$

52. ಐನ್ ಸ್ಟೀನ್ ನ ದ್ಯುತಿ ಸಮೀಕರಣದ ಪ್ರಕಾರ ಎಲೆಕ್ಟ್ರಾನ್ ಚಲನಶಕ್ತಿ ವಿರುದ್ಧ ವಿಕಿರಣದ ಆವೃತ್ತಿ ರೇಖಾಚಿತ್ರವು

(A)


(B)


(C)


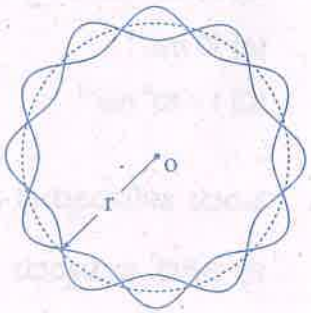
(D)


53. ಹೈಡ್ರೋಜನ್ ಅಣುವಿನ ಎರಡನೆ ಕಕ್ಷೆಯಲ್ಲಿ ಎಲೆಕ್ಟ್ರಾನ್ ಶಕ್ತಿ E_2 ಆಗಿದೆ. He^+ ನ ಮೂರನೇ ಕಕ್ಷೆಯಲ್ಲಿ ಎಲೆಕ್ಟ್ರಾನ್ ನಿನ ಶಕ್ತಿ

(A) $\frac{9}{16} E_2$ (B) $\frac{16}{9} E_2$ (C) $\frac{3}{16} E_2$ (D) $\frac{16}{3} E_2$

SPACE FOR ROUGH WORK

54. The figure shows standing de Broglie waves due to the revolution of electron in a certain orbit of hydrogen atom. Then the expression for the orbit radius is (all notations have their usual meanings)



(A) $\frac{h^2\epsilon_o}{\pi me^2}$

(B) $\frac{4h^2\epsilon_o}{\pi me^2}$

(C) $\frac{9h^2\epsilon_o}{\pi me^2}$

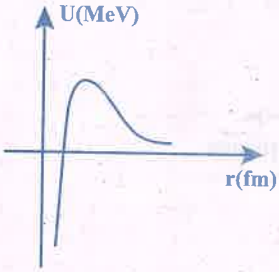
(D) $\frac{16h^2\epsilon_o}{\pi me^2}$

55. An electron in an excited state of Li^{2+} ion has angular momentum $\frac{3h}{2\pi}$. The de Broglie wavelength of electron in this state is $P\pi a_o$ (where a_o = Bohr radius). The value of P is

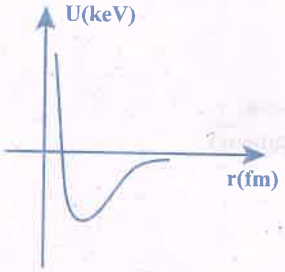
(A) 3 (B) 2 (C) 1 (D) 4

56. Which graph in the following diagrams correctly represents the potential energy of a pair of nucleons as a function of their separation?

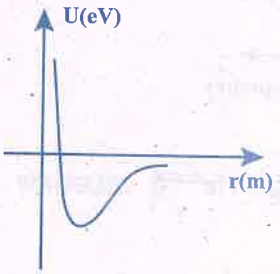
(A)



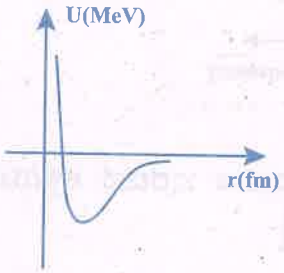
(B)



(C)



(D)



SPACE FOR ROUGH WORK

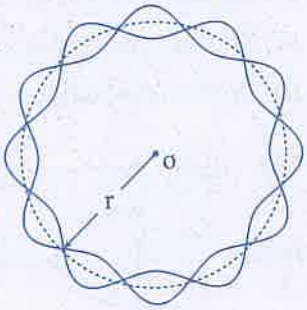
54. ಹೈಡ್ರೋಜನ್ ಪರಮಾಣುವಿನ ನಿರ್ದಿಷ್ಟ ಕಕ್ಷೆಯಲ್ಲಿ ಎಲೆಕ್ಟ್ರಾನ್ ಸುತ್ತುತ್ತಿದ್ದರೆ ಅದರ ಚಲನೆಯಿಂದಾಗಿ ಉಂಟಾಗುವ ಡೀ ಬ್ರಾಗಲಿ ಸ್ಥಾಯೀ ಅಲೆಗಳನ್ನು ಚಿತ್ರದಲ್ಲಿ ತೋರಿಸಲಾಗಿದೆ. ಹಾಗಾದರೆ ಈ ಕಕ್ಷೆಯ ತ್ರಿಜ್ಯದ ಗಣಿತೋಕ್ತಿ (ಎಲ್ಲಾ ಸಂಕೇತಗಳು ತಮ್ಮ ಸಾಮಾನ್ಯ ಅರ್ಥ ಹೊಂದಿವೆ)

(A) $\frac{h^2 \in_o}{\pi me^2}$

(B) $\frac{4h^2 \in_o}{\pi me^2}$

(C) $\frac{9h^2 \in_o}{\pi me^2}$

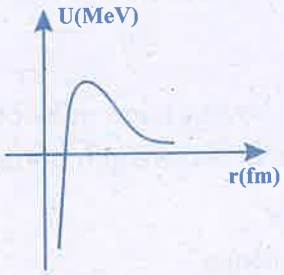
(D) $\frac{16h^2 \in_o}{\pi me^2}$

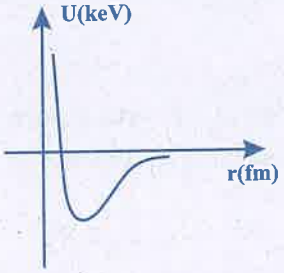


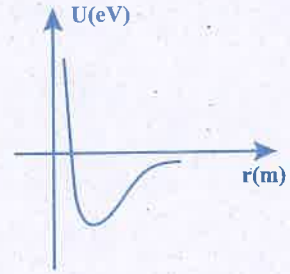
55. ಎರಡು ಎಲೆಕ್ಟ್ರಾನ್ ತೆಗೆದಿರುವ ಲೀಥೀಯಮ್ ನಲ್ಲಿ ಉತ್ತೇಜಿತ ಸ್ಥಿತಿಯಲ್ಲಿ ಎಲೆಕ್ಟ್ರಾನ್ ನ ಕೋನೀಯಸಂವೇಗವು $\frac{3h}{2\pi}$ ಆಗಿದೆ. ಎಲೆಕ್ಟ್ರಾನ್ ನ ಡಿಬ್ರಾಯ್ ತರಂಗಾತರ ಈ ಸ್ಥಿತಿಯಲ್ಲಿ $P\pi a_o$ ಆಗಿದೆ. (a_o = ಬೋರ್ ನ ತ್ರಿಜ್ಯ ಹಾಗಾದರೆ P ನ ಬೆಲೆ

(A) 3 (B) 2 (C) 1 (D) 4

56. ಎರಡು ನ್ಯೂಕ್ಲಿಯಾನುಗಳ ಬೇರ್ಪಡಿಕೆಯ ಅಂತರಕ್ಕೆ ತಕ್ಕಂತೆ ಅವುಗಳ ನ್ಯೂಕ್ಲಿಯರ್ ಪ್ರಚ್ಛನ್ನ ಶಕ್ತಿಯ ಬದಲಾಗುವ ಗ್ರಾಫ್ ನಕ್ಷೆಯನ್ನು ಯಾವ ಚಿತ್ರದಲ್ಲಿ ಸರಿಯಾಗಿ ತೋರಿಸಲಾಗಿದೆ ?

(A)


(B)


(C)


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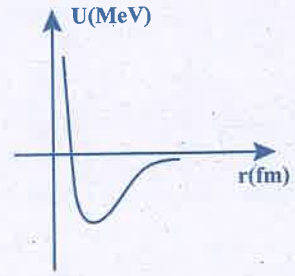


SPACE FOR ROUGH WORK

In a nuclear reactor heavy nuclei is not used as moderators because

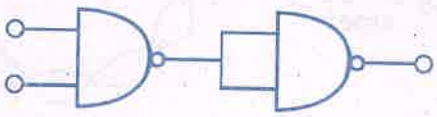
(A) They will break up

(B) Elastic collision of neutrons with heavy nuclei will not slow them down.

(C) The net weight of the reactor would be unbearably high

(D) Substances with heavy nuclei do not occur in liquid or gaseous state at room temperature.

The circuit given represents which of the logic operations?



(A) OR

(B) AND

(C) NOT

(D) NOR

Identify the incorrect statement:

(A) when a P-N junction diode is forward biased, the width of the depletion region decreases.

(B) when a P-N junction diode is reverse biased, the barrier potential increases.

(C) a photo diode is operated in the reverse bias.

(D) an LED is a lightly doped P-N junction diode which emits spontaneous radiation on forward biasing.

Three photodiodes D_1, D_2 and D_3 are made of semiconductors having band gaps of 2.5 eV, 2 eV and 3eV respectively. Which one will be able to detect light of wavelength 600 nm?

(A) D_1 only

(B) Both D_1 and D_3

(C) D_2 only

(D) All the three diodes

SPACE FOR ROUGH WORK

57. ನ್ಯೂಕ್ಲಿಯರ್ ಕ್ರಿಯಾಕಾರಿಯಲ್ಲಿ ಭಾರವಾದ ನ್ಯೂಕ್ಲಿಯಸ್ ಗಳನ್ನು ಮಂದಕಾರಿಯಾಗಿ ಉಪಯೋಗಿಸದಿರು
ಕಾರಣ

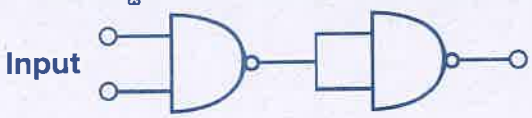
(A) ಅವು ಸಿಡಿಯುತ್ತವೆ.

(B) ನ್ಯೂಟ್ರಾನ್ ಗಳು ಭಾರವಾದ ನ್ಯೂಕ್ಲಿಯಸ್ ನೊಂದಿಗೆ ಸ್ಥಿತಿಸ್ಥಾಪಕ ಚದುರಿಕೆಗೆ ಒಳಪಡಿಸುವಾಗ ಅ
ನಿಧಾನಗೊಳ್ಳುವುದಿಲ್ಲ.

(C) ಕ್ರಿಯಾಕಾರಿಯ ಒಟ್ಟು ತೂಕ ತುಂಬಾ ಹೆಚ್ಚಾಗುವುದು.

(D) ಭಾರವಾದ ನ್ಯೂಕ್ಲಿಯಸ್ ಇರುವ ವಸ್ತುಗಳು ದ್ರವ ಅಥವಾ ಅನಿಲ ರೂಪದಲ್ಲಿ ಇರುವುದಿಲ್ಲ.

58. ಕೆಳಗೆ ಕೊಟ್ಟಿರುವ ಮಂಡಲವು ಯಾವ ತಾರ್ಕಿಕ ಕ್ರಿಯೆಯನ್ನು ಬಿಂಬಿಸುತ್ತದೆ.



(A) OR

(B) AND

(C) NOT

(D) NOR

59. ತಪ್ಪಾಗಿರುವ ಹೇಳಿಕೆಯನ್ನು ಗುರುತಿಸಿ.

(A) P-N ಸಂಧಿ ಡಯೋಡು ನೇರ ಪಕ್ಷಪಾತದಲ್ಲಿದ್ದರೆ ಬರಿದಾದ ಸ್ಥರದ ಅಗಲ ಕಡಿಮೆಯಾಗುತ್ತದೆ.

(B) P-N ಸಂಧಿ ಡಯೋಡು ವಿಪರ್ಯಾಯ ಪಕ್ಷಪಾತದಲ್ಲಿದ್ದರೆ ಸೀಮಾ ಎತ್ತರ ಹೆಚ್ಚಾಗುತ್ತದೆ.

(C) ಫೋಟೋ ಡಯೋಡು ವಿಪರ್ಯಾಯ ಪಕ್ಷಪಾತದಲ್ಲಿ ಕಾರ್ಯನಿರ್ವಹಿಸುತ್ತದೆ

(D) ಬೆಳಕು ವಿಸರ್ಜಿಸುವ ಡಯೋಡು(LED) ಒಂದು ಕಡಿಮೆ ಡೋಪು ಮಾಡಿದ P-N ಸಂಧಿ ಡಯೋಡು ಹಾಗ
ನೇರ ಪಕ್ಷಪಾತದಲ್ಲಿ ಸ್ವಯಂ ಪ್ರೇರಿತ ವಿಕಿರಣ ಹೊರಸೂಸುತ್ತದೆ.

60. ಮೂರು ಫೋಟೋ ಡಯೋಡು D_1, D_2 ಮತ್ತು D_3 ಗಳನ್ನು ಶಕ್ತಿ ಪಟ್ಟಿಯ ಅಂತರ ಕ್ರಮವಾಗಿ 2.5 eV, 2 eV ಮ
3eV ಇರುವ ಅರೆವಾಹಕಗಳಿಂದ ಮಾಡಲ್ಪಟ್ಟಿದೆ. 600 nm ತರಂಗಾಂತರವಿರುವ ಬೆಳಕನ್ನು ಬೀಳಿಸಿದರೆ ಅದ
ಯಾವ ಫೋಟೋ ಡಯೋಡ್ ಕಂಡು ಹಿಡಿಯಬಲ್ಲದು /ಬಲ್ಲವು?

(A) D_1 ಮಾತ್ರ

(B) D_1 ಮತ್ತು D_3

(C) D_2 ಮಾತ್ರ

(D) ಎಲ್ಲಾ ಡಯೋಡುಗಳು

SPACE FOR ROUGH WORK

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1. A block of mass m is connected to a light spring of force constant k. The system is placed inside a damping medium of damping constant b. The instantaneous values of displacement, acceleration and energy of the block are x, a and E respectively. The initial amplitude of oscillation is A and ω' is the angular frequency of oscillations. The incorrect expression related to the damped oscillations is

   (A) $\omega' = \sqrt{\frac{k}{m} - \frac{b^2}{4m^2}}$ (B) $m\frac{d^2x}{dt^2} + b\frac{dx}{dt} + kx = 0$ (C) $E = \frac{1}{2}kA^2e^{-\frac{bt}{m}}$ (D) $x = Ae^{-\frac{b}{m}}\cos(\omega' t + \phi)$

2. The speed of sound in an ideal gas at a given temperature T is v. The rms speed of gas molecules at that temperature is v_{rms}. The ratio of the velocities v and v_{rms} for helium and oxygen gases are X and X' respectively. Then $\frac{X}{X'}$ is equal to

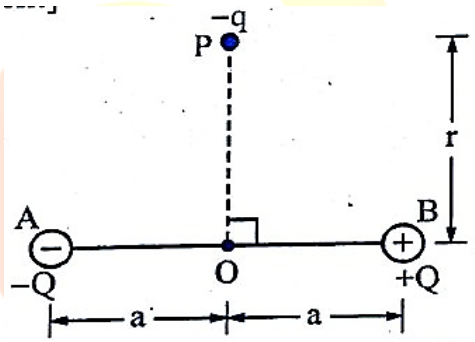
   (A) $\frac{5}{\sqrt{21}}$ (B) $\frac{21}{5}$ (C) $\sqrt{\frac{5}{21}}$ (D) $\frac{21}{\sqrt{5}}$

3. A positively charged glass rod is brought near uncharged metal sphere, which is mounted on an insulated stand. If the glass rod is removed, the net charge on the metal sphere is

   (A) Zero (B) Positive charge (C) 1.6×10^{-19} C (D) Negative charge

4. In the situation shown in the diagram, magnitude of $q << |Q|$ and $r >> a$. The net force on the free charge $-q$ and net torque on it about O at the instant shown respectively

   [$p = 2aQ$ is the dipole moment]



   (A) $\frac{1}{4\pi\varepsilon_0}\frac{pq}{r^2}\hat{k}, \frac{1}{4\pi\varepsilon_0}\frac{pq}{r^3}\hat{i}$ (B) $\frac{1}{4\pi\varepsilon_0}\frac{pq}{r^3}\hat{i}, +\frac{1}{4\pi\varepsilon_0}\frac{pq}{r^2}\hat{k}$

   (C) $-\frac{1}{4\pi\varepsilon_0}\frac{pq}{r^2}\hat{k}, -\frac{1}{4\pi\varepsilon_0}\frac{pq}{r^3}\hat{i}$ (D) $\frac{1}{4\pi\varepsilon_0}\frac{pq}{r^3}\hat{i}, -\frac{1}{4\pi\varepsilon_0}\frac{pq}{r^2}\hat{k}$

5. Pressure of ideal gas at constant volume is proportional to

   (A) average potential energy of the molecules

   (B) average kinetic energy of the molecules

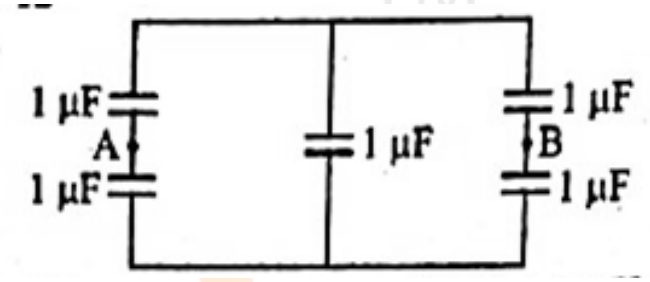
   (C) total energy of the gas

   (D) force between the molecules

6. Electric field at a distance ' r ' from an infinitely long uniformly charged straight conductor, having linear charge density λ is E_1. Another uniformly charged conductor having same linear charge density λ is bent into a semicircle of radius ' r '. The electric field at its centre is E_2. Then

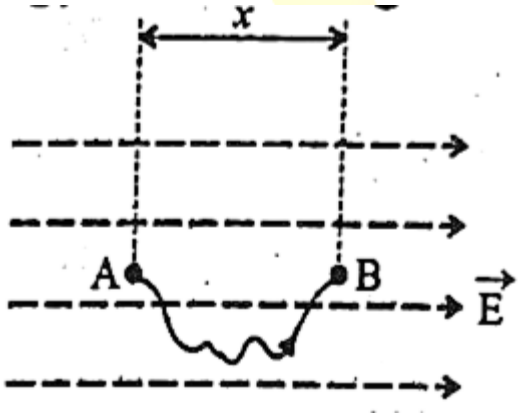
(A) $E_2 = \frac{E_1}{r}$ (B) $E_1 = \pi r E_2$ (C) $E_1 = E_2$ (D) $E_2 = \pi r E_1$

7. Five capacitors each of value $1\mu F$ are connected as shown in the figure. The equivalent capacitance between A and B is



(A) 1 μF (B) 5 μF (C) 2 μF (D) 3 μF

8. A uniform electric field vector $\vec{E}$ exists along horizontal direction as shown. The electric potential at A is V_A. A small point charge q is slowly taken from A to B along the curved path as shown. The potential energy of the charge when it is at point B is

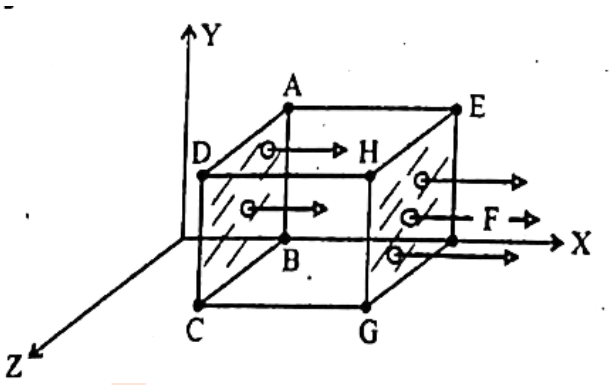


(A) $q[V_A + Ex]$ (B) qEx (C) $q[Ex - V_A]$ (D) $q[V_A - Ex]$

9. A parallel plate capacitor of capacitance C_1 with a dielectric slab in between its plates is connected to a battery. It has a potential difference V_1 across its plates. When the dielectric slab is removed, keeping the capacitor connected to the battery, the new capacitance and potential difference are C_2 and V_2 respectively. Then,

(A) $V_1 > V_2, C_1 > C_2$ (B) $V_1 = V_2, C_1 > C_2$ (C) $V_1 < V_2, C_1 > C_2$ (D) $V_1 = V_2, C_1 < C_2$

10. A cubical Gaussian surface has side of length $a = 10\text{cm}$. Electric field lines are parallel to x-axis as shown. The magnitudes of electric fields through surfaces ABCD and EFGH are 6kNC^{-1} and 9kNC^{-1} respectively. Then the total charge enclosed by the cube is $\left[\text{ Take } \varepsilon_0 = 9\times10^{-12}\,\text{Fm}^{-1}\right]$



(A) 1.35nC (B) 0.27nC (C) –1.35nC (D) –0.27nC

11. The four bands of a colour coded resistor are of the colours gray, red, gold and gold. The value of the resistance of the resistor is

(A) $82\Omega\pm10\%$ (B) $82\Omega\pm5\%$ (C) $8.2\Omega\pm5\%$ (D) $5.2\Omega\pm5\%$

12. A wire of resistance R is connected across a cell of emf ε and internal resistance r. The current through the circuit is I. In time t, the work done by the battery to establish the current I is

(A) $\frac{\varepsilon^2 t}{R}$ (B) I^2Rt (C) IRt (D) ε It

13. For a given electric current the drift velocity of conduction electrons in a copper wire is v_d and their mobility is μ. When the current is increased at constant temperature

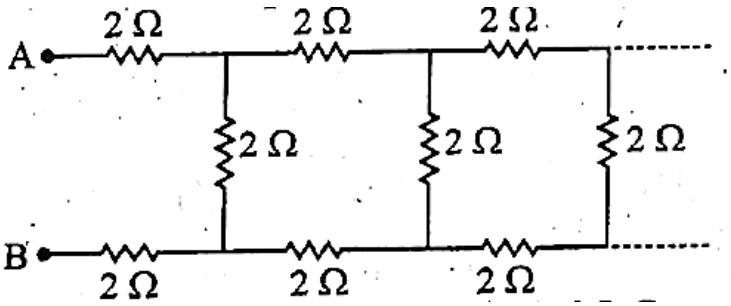
(A) v_d remains the same, μ increases (B) v_d remains the same, μ decreases

(C) v_d decreases, μ remains the same (D) v_d increases, μ remains the same

14. Ten identical cells each emf 2V and internal resistance 1Ω are connected in series with two cells wrongly connected. A resistor of 10Ω is connected to the combination. What is the current through the resistor?

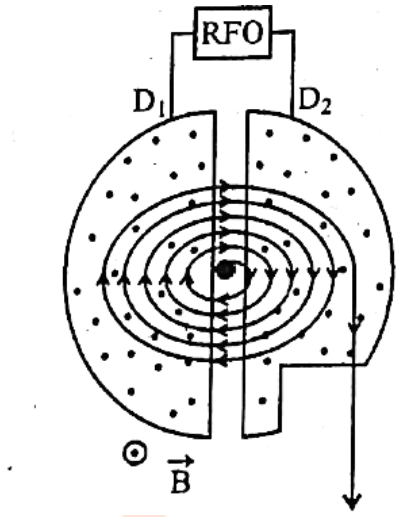
(A) 2.4A (B) 1.2A (C) 0.6A (D) 1.8A

15. The equivalent resistance between the points A and B in the following circuit is



(A) 5.5Ω (B) 5Ω (C) 0.05Ω (D) 0.5Ω

16. A charged particle is subjected to acceleration in a cyclotron as shown. The charged particle undergoes increase in its speed



(A) Only inside D_2 (B) Only inside D_1

(C) Inside D_1, D_2 and the gaps (D) Only in the gap between D_1 and D_2

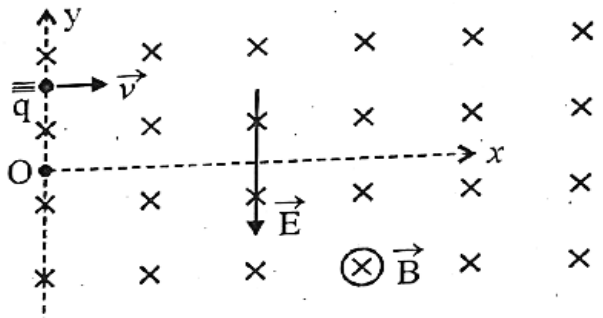
17. The resistance of a carbon resistor is $4.7\text{k}\Omega \pm 5\%$. The colour of the third band is

(A) red (B) orange (C) violet. (D) gold

18. A moving coil galvanometer is converted into an ammeter of range 0 to 5mA. The galvanometer resistance is 90Ω and the shunt resistance has a value of 10Ω. If there are 50 divisions in the galvanometer-turned-ammeter on either sides of zero, its current sensitivity is

(A) $1\times10^5\,\text{A/div}$ (B) $1\times10^5\,\text{div/A}$ (C) $2\times10^4\,\text{A/div}$ (D) $2\times10^4\,\text{div/A}$

19. A positively charged particle of mass m is passed through a velocity selector. It moves horizontally rightward without deviation along the line $y=\frac{2mv}{qB}$ with a speed v. The electric field is vertically downwards and magnetic field is into the plane of the paper. Now, the electric field is switched off at $t=0$. The angular momentum of the charged particle about origin O at $t=\frac{\pi m}{qB}$ is



(A) $\frac{2mE^2}{qB^3}$ (B) $\frac{mE^3}{qB^2}$ (C) zero (D) $\frac{mE^2}{qB^3}$

20. The Curie temperatures of Cobalt and iron are 1400K and 1000K respectively. At $T = 1600K$, the ratio of magnetic susceptibility of Cobalt to that of iron is

(A) 3 (B) $\frac{5}{7}$ (C) $\frac{7}{5}$ (D) $\frac{1}{3}$

21. The torque acting on a magnetic dipole placed in uniform magnetic field is zero, when the angle between the dipole axis and the magnetic field is _____.

(A) 45° (B) 90° (C) 60° (D) zero

22. The horizontal component of Earth's magnetic field at a place is 3×10^{-5}T. If the dip at that place is 45°, the resultant magnetic field at that place is

(A) $\frac{3}{\sqrt{2}}\times10^{-5}$T (B) $3\sqrt{2}\times10^{-5}$T (C) $\frac{3}{2}\sqrt{3}\times10^{-5}$T (D) 3×10^{-5}T

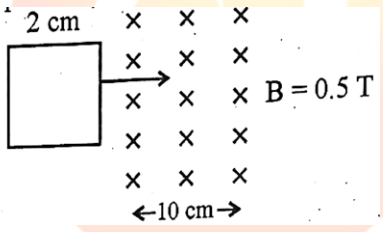
23. A proton and an alpha-particle moving with the same velocity enter a uniform magnetic field with their velocities perpendicular to the magnetic field. The ratio of radii of their circular paths is

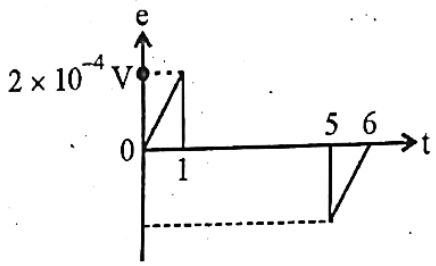
(A) 1:4 (B) 1:2 (C) 4:1 (D) 2:1

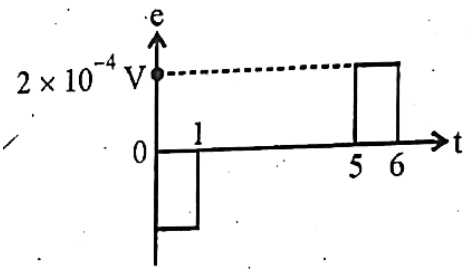
24. A metallic rod of length 1m held along east-west direction is allowed to fall down freely. Given horizontal component of earth's magnetic field $B_H = 3\times10^{-5}$T. The emf induced in the rod at an instant $t = 2$s after it is released is (Take $g = 10\text{ms}^{-2}$)

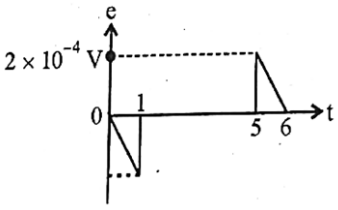
(A) 3×10^{-3}V (B) 6×10^{-3}V (C) 3×10^{-4}V (D) 6×10^{-4}V

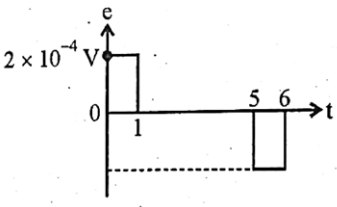
25. A square loop of side 2cm enters a magnetic field with a constant speed of 2cms^{-1} as shown. The front edge enters the field at $t = 0$ s. Which of the following graph correctly depicts the induced emf in the loop? (Take clockwise direction positive)



(A)


(B)


(C)


(D)


26. In series LCR circuit at resonance, the phase difference between voltage and current is

(A) π (B) $\frac{\pi}{2}$ (C) $\frac{\pi}{4}$ (D) zero

27. An ideal transformer has a turns ratio of 10. When the primary is connected to $220V, 50Hz$ ac source, the power output is

(A) $\frac{1}{10}^{\text{th}}$ the power input (B) zero

(C) equal to power input (D) 10 times the power input

28. The current in a coil changes from $2A$ to $5A$ in $0.3s$. The magnitude of emf induced in the coil is $1.0V$. The value of self-inductance of the coil is

(A) 100mH (B) 10mH (C) 0.1mH (D) 1.0mH

29. The ratio of the magnitudes of electric field to the magnetic field of an electromagnetic wave is of the order of

(A) $10^5 ms^{-1}$ (B) $10^8 ms^{-1}$ (C) $10^{-5} ms^{-1}$ (D) $10^{-8} ms^{-1}$

30. For a point object, which of the following always produces virtual image in air?

(A) Plano-convex lens (B) Biconvex lens (C) Convex mirror (D) Concave mirror

31. For a given pair of transparent media, the critical angle for which colour is maximum?

(A) Red (B) Violet (C) Blue (D) Green

32. An equiconvex lens made of glass of refractive index $\frac{3}{2}$ has focal length f in air. It is completely immersed in water of refractive index $\frac{4}{3}$. The percentage change in the focal length is

(A) 300% decrease (B) 300% increase (C) 400% decrease (D) 400% increase

33. A point object is moving at a constant speed of $1ms^{-1}$ along the principal axis of a convex lens of focal length $10\,cm$. The speed of the image is also $1ms^{-1}$, when the object is at cm from the optic centre of the lens.

(A) 15 (B) 5 (C) 20 (D) 10

34. When light propagates through a given homogeneous medium, the velocities of

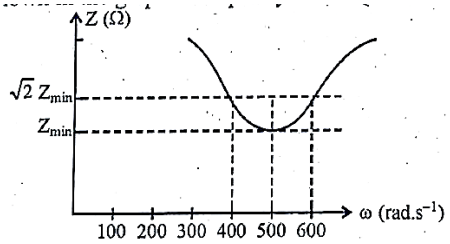
(A) primary wavefronts are lesser than those of secondary wavelets.

(B) primary wavefront and wavelets are equal.

(C) primary wavefronts are greater than or equal to those of secondary wavelets.

(D) primary wavefront are larger than those of secondary wavelets.

35. Total impedance of a series LCR circuit varies with angular frequency of the AC source connected to it as shown in the graph. The quality factor Q of the series LCR circuit is



(A) 2.5 (B) 1 (C) 5 (D) 0.4

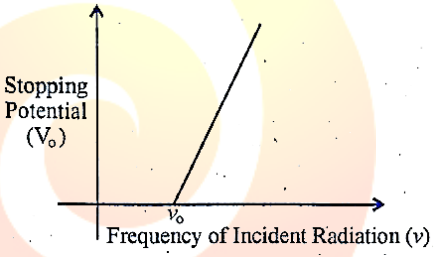
36. In the Young's double slit experiment, the intensity of light passing through each of the two double slits is $2\times10^{-2}\,\text{Wm}^{-2}$. The screen-slit distance is very large in comparison with slit-slit distance. The fringe width is β. The distance between the central maximum and a point P on the screen is $x=\frac{\beta}{3}$. Then the total light intensity at that point is

(A) $4\times10^{-2}\,\text{Wm}^{-2}$ (B) $16\times10^{-2}\,\text{Wm}^{-2}$ (C) $2\times10^{-2}\,\text{Wm}^{-2}$ (D) $8\times10^{-2}\,\text{Wm}^{-2}$

37. A 60W source emits monochromatic light of wavelength 662.5nm. The number of photons emitted per second is

(A) 2×10^{20} (B) 2×10^{29} (C) 5×10^{26} (D) 5×10^{17}

38. In an experiment to study photo-electric effect the observed variation of stopping potential with frequency of incident radiation is as shown in the figure. The slope and y-intercept are respectively

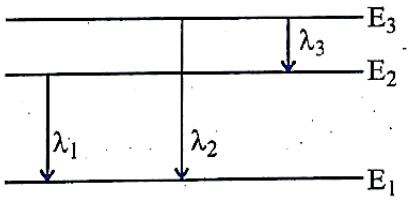


(A) $\frac{h\nu}{e}, v_0$. (B) $h\nu, -h\nu_0$ (C) $\frac{h\nu}{e}, -\frac{h}{e}$ (D) $\frac{h}{e}, -\frac{h\nu_0}{e}$

39. In the Rutherford's alpha scattering experiment, as the impact parameter increases, the scattering angle of the alpha particle

(A) is always 90° (B) increases (C) decreases (D) remains the same

40. Three energy levels of hydrogen atom and the corresponding wavelength of the emitted radiation due to different electron transition are as shown. Then.



(A) $\lambda_1=\frac{\lambda_2\lambda_3}{\lambda_2+\lambda_3}$ (B) $\lambda_2=\frac{\lambda_1\lambda_3}{\lambda_1+\lambda_3}$ (C) $\lambda_2=\lambda_1+\lambda_3$ (D) $\lambda_3=\frac{\lambda_1\lambda_2}{\lambda_1+\lambda_2}$

41. An unpolarised light of intensity I is passed through two polaroids kept one after the other with their planes parallel to each other. The intensity of light emerging from second polaroid is $\frac{I}{4}$. The angle between the pass axes of the polaroids is

(A) 0° (B) 30° (C) 60° (D) 45°

42. A nucleus with mass number 220 initially at rest emits an alpha particle. If the Q value of reaction is 5.5MeV, calculate the value of kinetic energy of alpha particle.

(A) 5.4MeV (B) 4.5MeV (C) 7.4MeV (D) 6.5MeV

43. A radioactive sample has half-life of 3 years. The time required for the activity of the sample to reduce to $\frac{1}{5}$ th of its initial value is about

(A) 7 years (B) 5 years (C) 15 years (D) 10 years

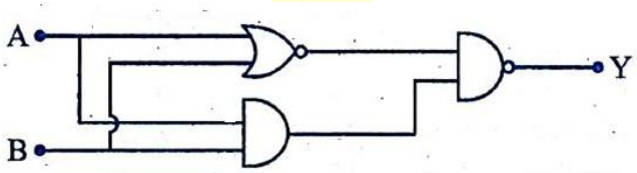
44. When a p-n junction diode is in forward bias, which type of charge carriers flows in the connecting wire?

(A) Ions (B) Holes (C) Protons (D) Free electrons

45. A full-wave rectifier with diodes D_1 and D_2 is used to rectify 50Hz alternating voltage. The diode D_1 conducts times in one second.

(A) 25 (B) 50 (C) 75 (D) 100

46. The truth table for the given circuit is



(A)

A	B	Y
1	1	1
1	0	0
0	1	1
0	0	1

(B)

A	B	Y
1	1	1
1	0	1
0	1	1
0	0	0

(C)

A	B	Y
1	1	1
1	0	1
0	1	1
0	0	1

(D)

A	B	Y
1	1	1
1	0	1
0	1	0
0	0	1

47. The energy gap of an LED is 2.4eV. When the LED' is switched ' ON ', the momentum of the emitted photons is

(A) $2.56\times10^{-27}\,\text{kg}\cdot\text{m}\cdot\text{s}^{-1}$ (B) $0.64\times10^{-27}\,\text{kg}\cdot\text{m.s}^{-1}$

(C) $1.28\times10^{-11}\,\text{kg}\cdot\text{m.s}^{-1}$ (D) $1.28\times10^{-27}\,\text{kg}\cdot\text{m}\cdot\text{s}^{-1}$

48. In the following equation representing β^- decay, the number of neutrons in the nucleus X is

$$^{210}_{83}\text{Bi} \rightarrow \text{X} + \text{e}^{-1} + \bar{\nu}$$

(A) 127 (B) 84 (C) 125 (D) 126

49. A body is moving along a straight line with initial velocity v_0, Its acceleration a is constant. Afler 1 seconds, its velocity becomes v. The average velocity of the body over the given time interval is

(A) $\bar{v} = \frac{v^2 + v_0^2}{2at}$ (B) $\bar{v} = \frac{v^2 - v_0^2}{2at}$ (C) $\bar{v} = \frac{v^2 + v_0^2}{at}$ (D) $\bar{v} = \frac{v^2 - v_0^2}{at}$

50. A particle is in uniform circular motion. Related to one complete revolution or of the particle, which among the statements is incorrect?

(A) Displacement of the particle is zero. (B) Average velocity of the particle is zero.

(C) Average speed of the particle is zero. (D) Average acceleration of the particle is zero.

51. A body of mass 10kg is kept on a horizontal surface. The coefficient of the kinetic friction between the body and the surface is 0.5. A horizontal force of 60N is applied on the body. The resulting acceleration of the body is about

(A) 5ms^{-2} (B) zero (C) 6ms^{-2} (D) 1ms^{-2}

52. A ball of mass 0.2kg is thrown vertically down from a height of 10m. It collides with the floor and loses 50% of its energy and then rises back to the same height. The value of its initial velocity is

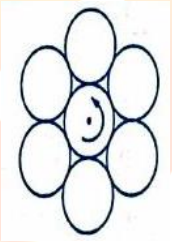
(A) 14ms^{-1} (B) 20ms^{-1} (C) 196ms^{-1} (D) zero

53. The moment of inertia of a rigid body about an axis

(A) does not depend on its shape. (B) does not depend on its size.

(C) depends on the position of axis of rotation. (D) does not depend on its mass.

54. Seven identical discs are arranged in a planar pattern, so as to touch each other as shown in the figure. Each disc has mass ' m ' radius R. What is the moment of inertia of system of six discs about an axis passing through the centre of central disc and normal to plane of all discs?



(A) 100mR^2 (B) $85\frac{\text{mR}^2}{2}$ (C) $55\frac{\text{mR}^2}{2}$ (D) 27mR^2

55. The true length of a wire is 3.678cm. When the length of this wire is measured using instrument A, the length of the wire is 3.5cm. When the length of the wire is measured using instrument B, it is found to have length 3.38cm. Then the

(A) measurement with A is more accurate while measurement with B is more precise.

(B) measurement with A is more precise while measurement with B is more accurate.

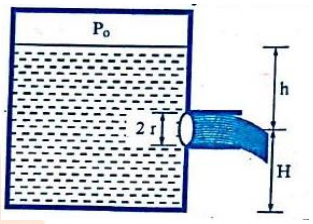
(C) measurement with B is more accurate and precise.

(D) measurement with A is more accurate and precise.

56. A stretched wire of a material whose Young's modulus $Y = 2\times10^{11}\,\text{Nm}^{-2}$ has Poisson's ratio 0.25 . Its lateral strain $\varepsilon_l = 10^{-3}$. The elastic energy density of the wire is

(A) $1\times10^{5}\,\text{Jm}^{-3}$ (B) $8\times10^{5}\,\text{Jm}^{-3}$ (C) $4\times10^{5}\,\text{Jm}^{-3}$ (D) $16\times10^{5}\,\text{Jm}^{-3}$

57. A closed water tank has cross-sectional area A. It has a small hole at a depth of h from the free surface of water. The radius of the hole is r so that $r \ll \sqrt{\frac{A}{\pi}}$. If P_0 is the pressure inside the tank above water level, and P_a is the atmospheric pressure, the rate of flow of the water coming out of the hole is [ρ is the density of water]



(A) $\pi r^2\sqrt{2gh+\frac{2(P_o-P_a)}{\rho}}$ (B) $\pi r^2\sqrt{gh+\frac{2(P_o-P_a)}{\rho}}$

(C) $\pi r^2\sqrt{2gH}$ (D) $\pi r^2\sqrt{2gh}$

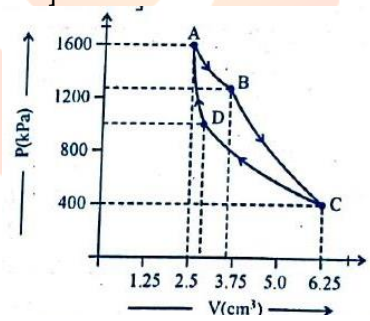
58. 100g of ice at 0°C is mixed with 100g of water at 100°C. The final temperature of the mixture is

[Take $L_f = 3.36\times10^{5}\,\text{Jkg}^{-1}$ and $S_w = 4.2\times10^{3}\,\text{Jkg}^{-1}\text{K}^{-1}$]

(A) 10°C (B) 1°C (C) 50°C (D) 40°C

59. The P-V diagram of a Carnot's engine is shown in the graph below. The engine uses 1 mole of an ideal gas as working substance. From the graph, the area enclosed by the $\text{P}-\text{V}$ diagram is

[The heat supplied to the gas is 8000J]



(A) 2000J (B) 1000J (C) 3000J (D) 1200J

60. When a planet revolves around the Sun, in general, for the planet

(A) linear momentum and aerial velocity are constant.

(B) angular momentum about the Sun and aerial velocity of the planet are constant.

(C) kinetic and potential energy of the planet are constant.

(D) linear momentum and linear velocity are constant.

KCET Board Exam – 2022

Subject: Physics **CODE: _____**

1. A magnetic field of flux density 1.0Wbm^{-2} acts normal to a 80 turn coil of 0.01m^2 area. If this coil is removed from the field in 0.2 second, the emf induced in it is

   (A) 5V (B) 4V (C) 8V (D) 0.8V

2. An alternative current is given by $i = i_1 \sin\omega t + i_2 \cos\omega t$. The r.m.s. current is given by

   (A) $\sqrt{\frac{i_1^2 + i_2^2}{\sqrt{2}}}$ (B) $\frac{i_1 + i_2}{\sqrt{2}}$ (C) $\frac{i_1 i_2}{\sqrt{2}}$ (D) $\sqrt{\frac{i_1^2 + i_2^2}{2}}$

3. Which of the following statements proves that Earth has a magnetic field?

   (A) A large quantity of iron- ore is found in the Earth

   (B) The intensity of cosmic rays stream of charged particles is more at the pole than at the equator.

   (C) Earth is planet rotating about the North South axis.

   (D) Earth is surrounded by ionosphere.

4. A long solenoid has 500 turns, when a current of 2A is passed through it, the resulting magnetic flux linked with each turn of the solenoid is $4\times10^{-3}\text{Wb}$, then self induction of the solenoid is

   (A) 1.0 henry (B) 4.0 henry (C) 2.5 henry (D) 2.0 henry

5. A fully charged capacitor 'C' with initial charge 'q_o' is connected to a coil self inductance 'L' at $t = 0$. The time at which the energy is stored equally between the electric and the magnetic field is

   (A) $\frac{\pi}{4}\sqrt{\text{LC}}$ (B) $2\pi\sqrt{\text{LC}}$ (C) $\sqrt{\text{LC}}$ (D) $\pi\sqrt{\text{LC}}$

6. The power of a equi- concave lens is -4.5D and is made od a material of R.I. 1.6, the radii of curvature of the lens is

   (A) 115.44cm (B) –26.6cm (C) +36.6cm (D) –2.66cm

7. A ray of light passes through an equilateral glass prism in such a manner that the angle of incidence is equal to the angle of emergence and each of these angles is equal to $\frac{3}{4}$ of the angle of the prism. The angle of deviation is

   (A) 30° (B) 45° (C) 39° (D) 20°

8. A convex lens of focal length 'f' is placed somewhere in between an object and a screen. The distance between the object and the screen is 'x'. If the numerical value of the magnification produced by the lens is 'm', then the focal length of the lens is

   (A) $\frac{(m-1)^2 x}{m}$ (B) $\frac{mx}{(m+1)^2}$ (C) $\frac{mx}{(m-1)^2}$ (D) $\frac{(m+1)^2 x}{m}$

9. A series resonant ac circuit contains a capacitance 10^{-6}F and an inductor of 10^{-4} H. The frequency of electrical oscillation will be

   (A) $\frac{10}{2\pi}\text{Hz}$ (B) 10^5Hz (C) 10Hz (D) $\frac{10^5}{2\pi}\text{Hz}$

10. In a series LCR circuit $R = 300\Omega$, $L = 0.9H$, $C = 2.0\ \mu F$ and $\omega = 1000\ rad\,s^{-1}$, then impedance of the circuit is

(A) 400Ω (B) 1300Ω (C) 900Ω (D) 500Ω

11. Which of the following radiations of electromagnetic waves has the highest wave length?

(A) Microwaves (B) X- rays (C) UV- rays (D) IR- rays

12. The fringe width for red colour as compared to that for violet colour is approximately

(A) 8 times (B) 3 times (C) Double (D) 4 times

13. In case of Fraunhoffer diffraction at a single slit the diffraction pattern on the screen is correct for which of the following statements?

(A) Central bright band having dark bands on either side.

(B) Central dark band having alternate dark and bright bands of decreasing intensity on either side.

(C) Central bright band having alternate dark and bright bands of decreasing intensity on either side

(D) Central dark band having uniform brightness on either side.

14. When a Compact Disc (CD) is illuminated by small source of white light coloured bands are observed. This is due to

(A) Reflection (B) Scattering (C) Diffraction (D) Interference

15. Consider a glass slab which is silvered at one side and the other side is transparent. Given the refractive index of the glass slab to be 1.5. If a ray of light is incident at an angle of $45°$ on the transparent side, the deviation of the ray of light from its initial path, when it comes out of the slab is

(A) $45°$ (B) $90°$ (C) $180°$ (D) $120°$

16. Focal length of a convex lens will be maximum for

(A) Red light (B) Blue light (C) Yellow light (D) Green light

17. For light diverging from a finite point source

(A) The intensity at the wave front does not depend on the distance.

(B) The wave front is cylindrical

(C) The intensity decreases in proportion to the distance squared.

(D) The wave front is parabolic.

18. The radius of hydrogen atom in the ground state is 0.53 Å. After collision with an electrons, it is found to have a radius of 2.12 Å, the principal quantum number 'n' of the final state of the atom is

(A) $n = 4$ (B) $n = 1$ (C) $n = 2$ (D) $n = 3$

19. In accordance with the Bohr's model, the quantum number that characterises the Earth's revolution around the Sun in an orbit of radius 1.5×10^{11} m with orbital speed 3×10^{4} m is [given mass of Earth $= 6\times10^{24}$ kg]

(A) 2.57×10^{74} (B) 5.98×10^{86} (C) 2.57×10^{38} (D) 8.57×10^{64}

20. If an electron is revolving in its Bohr orbit having Bohr radius of 0.529 Å, then the radius of third orbit is

(A) 5125 nm (B) 4234 nm (C) 4496 Å (D) 4.761 Å

21. Binding energy of a Nitrogen nucleus $\left[{}^{14}_{7}N\right]$, given $m\left[{}^{14}_{7}N\right]=14.00307u$

(A) 78 MeV (B) 104.7 MeV (C) 85 MeV (D) 206.5 MeV

22. In a photo electric experiment, if both the intensity and frequency of the incident light are doubled, then the saturation photo electric current

(A) becomes four times (B) remains constant

(C) is halved (D) is doubled

23. The kinetic energy of the photoelectrons increases by 0.52 eV when the wavelength of incident light is changed from 500 nm to another wavelength which is approximately

(A) 1000 nm (B) 700 nm (C) 400 nm (D) 1250 nm

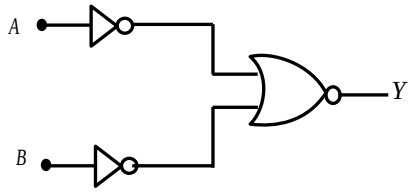
24. The de-Broglie wavelength of a particle of kinetic energy 'K' is λ; the wavelength of the particle, if its kinetic energy is $\frac{K}{4}$ is

(A) 4λ (B) λ (C) 2λ (D) $\frac{\lambda}{2}$

25. The forbidden energy gap of germanium crystal at '0' K is

(A) 6.57 eV (B) 0.071eV (C) 0.71 eV (D) 2.57 eV

26. Which logic gate is represented by the following combination of logic gates?



(A) NOR (B) OR (C) NAND (D) AND

27. A metallic rod of mass per unit length $0.5\,\text{kg m}^{-1}$ is lying horizontally on a smooth inclined plane which makes an angle of $30°$ with the horizontal. A magnetic field of strength $0.25\,T$ is acting on it in the vertical direction. When a current $'I'$ is flowing through it, the rod is not allowed to slide down. The quantity of current required to keep the rod stationary is

(A) 11.32 A (B) 7.14 A (C) 5.98 A (D) 14.76 A

28. A nuclear reactor delivers a power of 10^9 W, the amount of fuel consumed by the reactor in one hour is

(A) 0.96 g (B) 0.04 g (C) 0.08 g (D) 0.72 g

29. Which of the following radiations is deflected by electric field?

(A) α - particles (B) X-rays (C) Neutrons (D) γ – rays

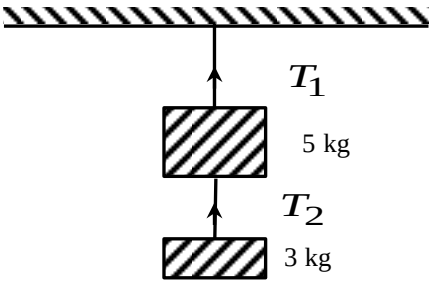
30. The resistivity of a semiconductor at room temperature is in between

(A) 10^{10} to $10^{12}\,\Omega$ cm (B) 10^{-2} to $10^{-5}\,\Omega$ cm (C) 10^{-3} to $10^{6}\,\Omega$ cm (D) 10^{6} to $10^{8}\,\Omega$ cm

31. A Car is moving on a circular horizontal track of radius 10 m with a constant speed of $10\,\text{ms}^{-1}$. A bob is suspended from the roof of the car by a light wire of length 1.0 m. The angle made by the vertical is (in radian)

(A) $\frac{\pi}{3}$ (B) $\frac{\pi}{6}$ (C) $\frac{\pi}{4}$ (D) 0

32. Two masses of $5\,\text{kg}$ and $3\,\text{kg}$ are suspended with the help of massless inextensible strings as shown in figure. When system is going upwards with acceleration $2\,\text{ms}^{-2}$, the value of T_1 is (use $g = 9.8\,\text{ms}^{-2}$)



(A) 59 N (B) 94.4 N (C) 35.4 N (D) 23.6 N

33. The Vernier scale of a travelling microscope has 50 division which coincides with 49 main scale divisions. If each main scale division is $0.5\,\text{mm}$, then the least count of the microscope is

(A) 0.5 cm (B) 0.01 cm (C) 0.5 mm (D) 0.01 mm

34. The displacement $'x'$ (in metre) of particle of mass $'m'$ (in kg) moving in one dimension under the action of a force, is related to time $'t'$ (in sec.) by, $t = \sqrt{x} + 3$. The displacement of the particle when its velocity is zero, will be

(A) $2m$ (B) $4m$ (C) $0m$ (D) $6m$

35. Two objects are projected at an angle $\theta°$ and $(90-\theta)°$, to the horizontal with the same speed. The ratio of their maximum vertical height is

(A) $\tan^2\theta : 1$ (B) $1:1$ (C) $\tan\theta : 1$ (D) $1 : \tan\theta$

36. A metallic rod breaks when strain produced is 0.2%. The Young's modulus the materials of the rod is $7\times10^9\,\text{Nm}^{-2}$. The area of cross section to support a load of 10^4 N is

(A) $7.1\times10^{-2}\ \text{m}^2$ (B) $7.1\times10^{-8}\ \text{m}^2$ (C) $7.1\times10^{-6}\ \text{m}^2$ (D) $7.1\times10^{-4}\ \text{m}^2$

37. A tiny spherical oil drop carrying a net charge q is balanced in still air, with a vertical uniform electric field of strength $\frac{81}{7}\pi\times10^5\ \text{V/m}$. When the field is switched off, the drop is observed to fall with terminal velocity $2\times10^{-3}\ \text{ms}^{-1}$. Here $g = 9.8\,\text{ms}^{-2}$, viscosity of air is $1.8\times10^{-5}\,\text{Ns/m}^2$ and the density of oil is $900\,\text{kgm}^{-3}$. The magnitude of $'q'$ is

(A) $3.2\times10^{-19}C$ (B) $0.8\times10^{-19}C$ (C) $8\times10^{-19}C$ (D) $1.6\times10^{-19}C$

38. "Heat cannot be itself flow from a body at lower temperature to a body at higher temperature". This statement corresponds to

(A) First law of thermodynamics (B) Second law of Thermodynamics
(C) Conservation of momentum (D) Conservation of mass

39. A smooth chain of length $2\,\text{m}$ is kept on a table such that its length of $60\,\text{cm}$ hangs freely from the edge of the table. The total mass of the chain is $4\,\text{kg}$. The work done in pulling the entire chain on the table is, (Take $g = 10\,\text{ms}^{-2}$)

(A) 2.0 J (B) 12.9 J (C) 6.3 J (D) 3.6 J

40. The angular speed of a motor wheel is increased from $1200\ \text{rpm}$ to $3120\ \text{rpm}$ in 16 seconds.

The angular acceleration of the motor wheel is

(A) $8\pi\ \text{rads}^{-2}$ (B) $2\pi\ \text{rads}^{-2}$ (C) $4\pi\ \text{rads}^{-2}$ (D) $6\pi\ \text{rads}^{-2}$

41. The centre of mass of an extended body on the surface of the earth and its centre of gravity

(A) centre of mass coincides with the centre of gravity of a body if the size of the body is negligible as compared to the size (or radius) of the earth

(B) are always at the same point for any size of the body.

(C) Are always at the same point only for spherical bodies.

(D) Can never be at the same point.

42. An electric dipole with dipole moment $4\times10^{-9}\text{Cm}$ is aligned at $30°$ with the direction of a uniform electric field of magnitude $5\times10^{4}\,\text{NC}^{-1}$, the magnitude of the torque acting on the dipole is

(A) $10\times10^{-3}\text{Nm}$ (B) $10^{-4}\ \text{Nm}$ (C) $\sqrt{3}\times10^{-4}\text{Nm}$ (D) 10^{-5}Nm

43. A charged particle of mass 'm' and charge 'q' is released from rest in an uniform electric field $\vec{E}$. Neglecting the effect of gravity, the kinetic energy of the charged particle after 't' second is

(A) $\frac{E^2q^2t^2}{2m}$ (B) $\frac{2E^2t^2}{mq}$ (C) $\frac{Eq^2m}{2t^2}$ (D) $\frac{Eqm}{t}$

44. The electric field and the potential of an electric dipole vary with distance r as

(A) $\frac{1}{r^3}$ and $\frac{1}{r^2}$ (B) $\frac{1}{r}$ and $\frac{1}{r^2}$ (C) $\frac{1}{r^2}$ and $\frac{1}{r}$ (D) $\frac{1}{r^2}$ and $\frac{1}{r^3}$

45. The displacement of a particle executing SHM is given by $X=3\sin\left[2\pi t+\frac{\pi}{4}\right]$ where 'x' is in metres and 't' is in seconds. The amplitude and maximum speed of the particle is

(A) $3\ \text{m}, 8\pi\ \text{ms}^{-1}$ (B) $3\ \text{m}, 2\pi\ \text{ms}^{-1}$ (C) $3\ \text{m}, 4\pi\ \text{ms}^{-1}$ (D) $3\ \text{m}, 6\pi\ \text{ms}^{-1}$

46. Electrical as well as gravitational effects can be thought to be caused by fields. Which of the following is true for an electrical or gravitational field?

(A) There is no way to verify the existence of force filed since it is just a concept

(B) The field concept is often used to describe contact forces.

(C) Gravitational or Electric fields does not exist in the space around an object

(D) Fields are useful for understanding forces acting through a distance.

47. Four charges $+q, +2q, +q$ and $-2q$ are placed at the corners of a square $ABCD$ respectively.

The force on a unit positive charge kept at the centre 'O' is

(A) perpendicular to AD (B) zero

(C) along the diagonal BD (D) along the diagonal AC

48. Wire bound resistors are made by

(A) winding the wires of an alloy of manganin, constantan, nichrome

(B) winding the wires of an alloy of Cu, Al, Ag

(C) winding the wires of an alloy of Si, Tu, Fe

(D) winding the wires of an alloy of Ge, Au, Ga

49. Ten identical cells each of potential 'E' and internal resistance 'r' are connected in series to form a closed circuit. An ideal voltammeter connected across three cells, will read

(A) $7E$ (B) $10E$ (C) $3E$ (D) $13E$

50. In an atom electrons revolve around the nucleus along a path of radius 0.72 Å making 9.4×10^{18} revolutions per second. The equivalent current is $-\left[\text{given } e=1.6\times10^{-19}C\right]$

(A) 1.8 A (B) 1.2 A (C) 1.5 A (D) 1.4 A

51. When a metal conductor connected to left gap of a meter bridge is heated, the balancing point

(A) shifts to the centre (B) shifts towards right

(C) shifts towards left (D) remains unchanged

52. Two tiny spheres carrying charges $1.8\,\mu C$ and $2.8\mu C$ are located at 40 cm apart. The potential at the mid-point of the line joining the two charges is

(A) 3.6×10^5 V (B) 3.8×10^4 V (C) 21×10^5 V (D) 4.3×10^4 V

53. A parallel plate capacitor is charged by connecting a 2 V battery across it. It is then disconnected from the battery and a glass slab is introduced between plates. Which of the following pairs of quantities decrease?

(A) Capacitance and charge (B) Charge and potential difference

(C) Potential difference and energy stored (D) Energy stores and capacitance.

54. A charged particle is moving in an electric field of $3\times10^{-10}\,\text{V m}^{-1}$ with mobility 2.5×10^6 $\text{m}^2/\text{V/s}$, its drift velocity is

(A) 1.2×10^{-4} ms^{-1} (B) $7.5\times10^{-4}\text{ms}^{-1}$ (C) $8.33\times10^{-4}\text{ms}^{-1}$ (D) $2.5\times10^4\text{ms}^{-1}$

55. A solenoid of length 50cm having 100 turns carries a current of 2.5 A. The magnetic field at one end of the solenoid is

(A) 9.42×10^{-4} T (B) 3.14×10^{-4} T (C) 6.285×10^{-4} T (D) 1.57×10^{-4} T

56. A galvanometer of resistance 50Ω is connected to a battery of 3 V along with a resistance $2950\,\Omega$ in series. A full scale deflection of 30 divisions is obtained in the galvanometer. In order to reduce this deflection to 20 divisions, the resistance in series should be

(A) 4450Ω (B) 6050Ω (C) 5550Ω (D) 5050Ω

57. A circular coil of wire of radius 'r' has 'n' turns and carries a current 'I'. The magnetic induction 'B' at a point on the axis of the coil at a distance $\sqrt{3}\,r$ from its centre is

(A) $\frac{\mu_0 nI}{4r}$ (B) $\frac{\mu_0 nI}{32r}$ (C) $\frac{\mu_0 nI}{8r}$ (D) $\frac{\mu_0 nI}{16r}$

58. If voltage across a bulb rated $220\text{ V}, 100\text{ W}$ drops by 2.5% of its rated value, the percentage of the rated value by which the power would decrease is

(A) 10% (B) 20% (C) 2.5% (D) 5%

59. A wire of a certain material is stretched slowly by 10%. Its new resistance and specific resistance becomes respectively

(A) both remain the same (B) 1.1 times, 1.1 times

(C) 1.2 times, 1.1 times (D) 1.21 times, same

60. A proton moves with a velocity of $5\times10^{6}\, j\ \text{ms}^{-1}$ through the uniform electric field, $\vec{E}=4\times10^{6}$ $\left[2\hat{i}+0.2\,j+0.1\text{k}\right]\text{Vm}^{-1}$ and the uniform magnetic field $\vec{B}=0.2\left[\hat{i}+0.2\,\hat{j}+\hat{\text{k}}\right]T$. The approximate net force acting on the proton is

(A) 20×10^{-13} N (B) 5×10^{-13} N (C) 25×10^{-13} N (D) 2.2×10^{-13} N

DR ACADEMY
DO RIGHT FOR GENUINE EDUCATION

KCET EXAMINATION – 2020
SUBJECT : PHYSICS

DATE :- 31-07-2020 **TIME : 10.30 AM TO 11.50 AM**

1. The value of acceleration due to gravity at a height of 10km from the surface of earth is x. At what depth inside the earth is the value of the acceleration due to gravity has the same value x ?
a) 5 km b) 20 km c) 10 km d) 15 km

Ans. b

Sol. $g_h = g\left(1-\frac{2h}{R}\right)$

$g_d = g\left(1-\frac{d}{R}\right)$

$g_h = g_d$

$g\left(1-\frac{2h}{R}\right) = g\left(1-\frac{d}{R}\right)$

$d = 2R$

$= 2\times 10 = 20 \text{ km}$

2. Young's modulus of a perfect rigid body is
a) Zero b) Unity c) Infinity
d) Between zero and unity

Ans. c

Sol. For a perfect rigid body elongation $\Delta l = 0$

$y = \left(\frac{F}{A}\right)\frac{l}{\Delta l}$ becomes infinity

3. A wheel starting from rest gains an angular velocity of 10 rad/s after uniformly accelerated for 5 sec. The total angle through which it has turned is
a) 25 rad
b) 100 rad
c) 25 π rad
d) 50 π rad about a vertical axis

Ans. a

Sol. $\omega_1 = 0$

$\omega_2 = 10 \text{ rad/sec}$

$t = 5 \text{ sec}$

$\theta = \left(\frac{\omega_1+\omega_2}{2}\right)\times t$

$\theta = \frac{(0+10)\times 5}{2} = 25 \text{ rad}$

4. Iceberg floats in water with part of it submerged. What is the fraction of the volume of iceberg submerged if the density of ice is ρ_i=0.917 g cm^{-3} ?
a) 0.917 b) 1 c) 0.458 d) 0

Ans. a

Sol. $V_b \cdot \rho_b = V_i \cdot \rho_l$

$\frac{V_i}{V_b} = \frac{\rho_b}{\rho_l} = \frac{0.917}{1} = 0.917$

5. A sphere, a cube and a thin circular plate all of same material and same mass initially heated to same high temperature are allowed to cool down under similar conditions. Then the
a) plate will cool the fastest and cube the slowest
b) sphere will cool the fastest and cube the slowest
c) plate will cool the fastest and sphere the slowest
d) cube will cool the fastest and plate the slowest

Ans. c

Sol. From,

$E \propto A$

Surface area is more for plate and less for sphere. Hence plate will cool the fastest and sphere the slowest

6. In an adiabatic expansion of an ideal gas the product of pressure and volume
a) Decreases
b) Increases
c) Remains constant
d) At first increases and then decreases

Ans. a

Sol. In an adiabatic expansion as temperature decreases from ideal gas equation PV=nRT the product of pressure and volume decreases

7. A certain amount of heat energy is supplied to a monoatomic ideal gas which expands at constant pressure. What fraction of the heat energy is converted into work ?

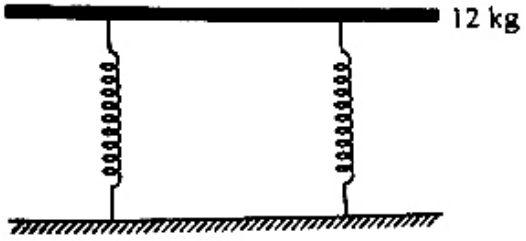
a) 1 b) $\frac{2}{3}$ c) $\frac{2}{5}$ d) $\frac{5}{7}$

Ans. c

Sol. $\frac{dW}{dQ} = 1 - \frac{1}{\gamma} = 1 - \frac{1}{(5/3)}$

$= \frac{2}{5}$

8. A tray of mass 12 kg is supported by two identical springs as shown in figure. When the tray is pressed down slightly and then released, it executes SHM with a time period of 1.5s. The spring constant of each spring is



a) 50 Nm^{-1} b) 0 c) 105 Nm^{-1} d) ∞

Ans. c

Sol. $T = 2\pi\sqrt{\frac{m}{k_{eff}}}$

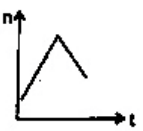
$\frac{3}{2} = 2\pi\sqrt{\frac{12}{2k}}$

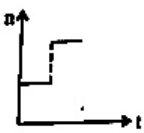
$\frac{9}{4} = 4\pi^2 \times \frac{12}{2k}$

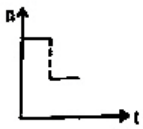
$k \simeq 105\ N/m$

9. A train whistling at constant frequency 'n' is moving towards a station at a constant speed V. The train goes past a stationary observer on the station. The frequency 'n' of the sound as heard by the observer is plotted as a function of time 't'. Identify the correct curve

a) 

b) 

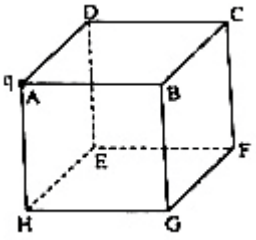
c) 

d) 

Ans. d

Sol. Conceptual

10. A point charge 'q' is placed at the corner of a cube of side 'a' as shown in the figure. What is the electric flux through the face ABCD ?



a) 0 b) $\frac{q}{24\varepsilon_0}$ c) $\frac{q}{6\varepsilon_0}$ d) $\frac{q}{72\varepsilon_0}$

Ans. a

Sol.

11. The electric field lines on the left have twice the separation on those on the right as shown in figure. If the magnitude of the field at A is 40 Vm^{-1}, what is the force on 20μC charge kept at B ?

a) $4x10^{-4}$ Vm^{-1} b) $8x10^{-4}$ Vm^{-1}
c) $16x10^{-4}$ Vm^{-1} d) $1x10^{-4}$ Vm^{-1}

Ans. a

Sol. $F = Eq$

$= 20 \times 20 \times 10^{-6}$

$= 4 \times 10^{-4}\ v/m$

12. An infinitely long thin straight wire has uniform charge density of $\frac{1}{4} \times 10^{-2} cm^{-1}$. What is the magnitude of electric field at a distance 20 cm from the axis of the wire ?

a) $1.12x10^8$ NC^{-1} b) $4.5x10^8$ NC^{-1}
c) $2.25x10^8$ NC^{-1} d) $9x10^8$ NC^{-1}

Ans. c

Sol. $E = \frac{\lambda}{2\pi\varepsilon_0 . r}$

$= \frac{1}{4} \times \frac{10^{-2}}{10^{-2}} \times 18 \times 10^9 \times 5$

$= 2.25 \times 10^8\ N/C$

13. A dipole moment 'P' and moment of inertia I is placed in a uniform electric field $\vec{E}$. If it is displaced slightly from its stable equilibrium position, the period of oscillation of dipole is

a) $\sqrt{\frac{PE}{I}}$ b) $2\pi\sqrt{\frac{I}{PE}}$ c) $\frac{1}{2\pi}\sqrt{\frac{PE}{I}}$ d) $\pi\sqrt{\frac{I}{PE}}$

Ans. b

Sol. $T = 2\pi\sqrt{\frac{I}{PE}}$

14. The difference between equivalent capacitances of two identical capacitors connected in parallel to that in series is 6μF. The value of capacitance of each capacitor is

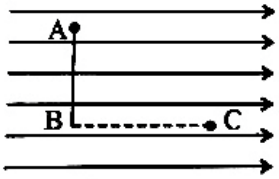
a) 2μF b) 3μF c) 4μF d) 6μF

Ans. c

Sol. $C_P - C_S = 6\mu F$

$2C - \frac{C}{2} = 6 \Rightarrow C = 4\mu F$

15. Figure shows three points A, B and C in a region of uniform electric field $\vec{E}$. The line AB is perpendicular and BC is parallel to the field lines. Then which of the following holds good ? (V_A, V_B and V_C represent the electric potential at points A, B and C respectively)



a) $V_A=V_B=V_C$ b) $V_A=V_B>V_C$
c) $V_A=V_B<V_C$ d) $V_A>V_B=V_C$

Ans. b

Sol. $V_A = V_B > V_C$

16. When a soap bubble is charged ?

a) Its radius increases
b) Its radius decreases
c) The radius remains the same
d) Its radius may increase or decrease

Ans. a

Sol. Its radius increases

17. A hot filament liberates an electron with zero initial velocity. The anode potential is 1200V. The speed of the electron when it strikes the anode is

a) 1.5×10^5 ms^{-1} b) 2.5×10^6 ms^{-1}
c) 2.1×10^7 ms^{-1} d) 2.5×10^8 ms^{-1}

Ans. c

Sol. $\frac{1}{2}mv^2 = Vq$ $\quad v = \sqrt{\frac{2Vq}{m}} = 2.1\times10^7$

18. A metal rod of length 10 cm and a rectangular cross – section of $1cm\times\frac{1}{2}cm$ is connected to a battery across opposite faces. The resistance will be

a) maximum when the battery is connected across $1cm\times\frac{1}{2}cm$ faces

b) maximum when the battery is connected across $10cm\times\frac{1}{2}cm$ faces

c) maximum when the battery is connected across 10 cm x 1 cm faces

d) same irrespective of the three faces

Ans. a

Sol. $R\alpha\frac{1}{A}$

Maximum when the battery is connected across $1cm\times\frac{1}{2}cm$ faces

19. A car has a fresh storage battery of e.m.f 12V and internal resistance $2x10^{-2}\Omega$. If the starter motor draws a current of 80A. Then the terminal voltage when the starter is on is

a) 12V b) 8.4V c) 10.4V d) 9.3V

Ans. c

Sol. $V = E - ir = 10.4\,V$

20. A potentiometer has a uniform wire of length 5m. A battery of emf 10V and negligible internal resistance is connected between its ends. A secondary cell connected to the circuit gives balancing length at 200 cm. The emf of the secondary cell is

a) 4V b) 6V c) 2V d) 8V

Ans. a

Sol. emf of cell in the secondary circuit
=potential gradient x balancing length
=(10/5) x 2 = 4V

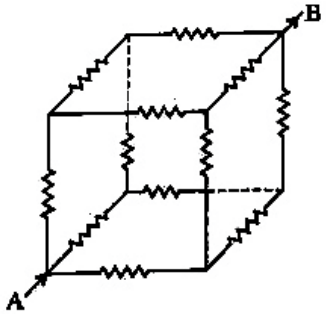
21. The colour code for a carbon resistor of resistance $0.28k\Omega\pm10\%$ is

a) Red, Grey, Brown, Silver
b) Red, Green, Brown, Silver
c) Red, Grey, Silver, Silver
d) Red, Green, Silver

Ans. a

Sol. Red, Grey, Brown, Silver

22. Each resistance in the given cubical network has resistance of 1Ω and equivalent resistance between A and B is

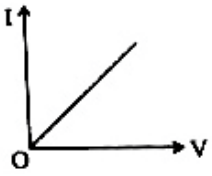


a) $\frac{5}{6}\Omega$ b) $\frac{6}{5}\Omega$ c) $\frac{5}{12}\Omega$ d) $\frac{12}{5}\Omega$

Ans. a

Sol. $R_{eff} = \frac{5}{6}r = \frac{5}{6}\Omega$

23. I-V characteristic of a copper wire of length L and area of cross-section A is shown in figure. The slope of the curve becomes



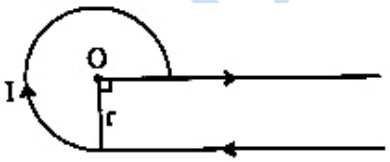
a) More if experiment is performed at higher temperature
b) More if a wire of steel of same dimension is used
c) Less if the area of the wire is increased
d) Less if the length of the wire is increased

Ans. d

Sol. $\text{Slope} = \frac{1}{R} = \frac{A}{\rho \times l}$

Less if the length of the wire is increased

24. In the given figure, the magnetic field at 'O'.



a) $\frac{3}{4}\frac{\mu_0 I}{r} + \frac{\mu_0 I}{4\pi r}$ b) $\frac{3}{10}\frac{\mu_0 I}{r} - \frac{\mu_0 I}{4\pi r}$

c) $\frac{3}{8}\frac{\mu_0 I}{r} + \frac{\mu_0 I}{4\pi r}$ d) $\frac{3}{8}\frac{\mu_0 I}{r} - \frac{\mu_0 I}{4\pi r}$

Ans. c

Sol. $B_{net} = B_1 + B_2 + B_3$

$= \frac{3}{8}\frac{\mu_0 I}{r} + \frac{\mu_0 I}{4\pi r} + 0$

25. The magnetic field at the origin due to a current element $i\vec{dl}$ placed at a point with vector position $\vec{r}$ is

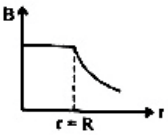
a) $\frac{\mu_0 i}{4\pi}\frac{\vec{dl}\times\vec{r}}{r^3}$ b) $\frac{\mu_0 i}{4\pi}\frac{\vec{r}\times\vec{dl}}{r^3}$

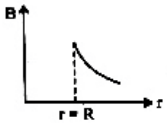
c) $\frac{\mu_0 i}{4\pi}\frac{\vec{dl}\times\vec{r}}{r^2}$ d) $\frac{\mu_0 i}{4\pi}\frac{\vec{r}\times\vec{dl}}{r^2}$

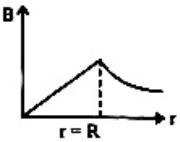
Ans. a

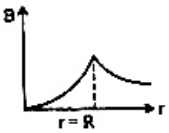
Sol. $\frac{\mu_0 i}{4\pi}\frac{\vec{dl}\times\vec{r}}{r^3}$

26. A long cylindrical wire of radius R carries a uniform current I flowing through it. The variation of magnetic field with distance 'r' from the axis of the wire is shown by

a) 

b) 

c) 

d) 

Ans. c

Sol. Conceptual

27. A cyclotron is used to accelerate protons $\left({}_1^1H\right)$, Deuterons $\left({}_1^2H\right)$ and α-particles $\left({}_2^4He\right)$. While exiting under similar conditions, the minimum K.E. is gained by

a) α-particle b) Proton
c) Deuteron d) Same for all

Ans. c

Sol. $K.E = \frac{q^2B^2r}{2m}$ $K.E = \frac{q^2}{m}$

Minimum K.E is gained by deuteron

28. A paramagnetic sample shows a net magnetization of 8 Am^{-1} when placed in an external magnetic field of 0.6T at a temperature of 4K. When the same sample is placed in an external magnetic field of 0.2 T at a temperature of 16 K. the magnetization will be

a) $\frac{32}{3}$ Am^{-1} b) $\frac{2}{3}$ Am^{-1}

c) 6 Am^{-1} d) 2.4 Am^{-1}

Ans. b

Sol. $I\alpha \frac{B}{T}$

$\frac{I_2}{I_1} = \frac{B_2}{B_1} \times \frac{T_1}{T_2} \qquad \frac{I_2}{8} = \frac{0.2}{0.6} \times \frac{4}{16} \qquad I_2 = \frac{2}{3} Am^{-1}$

29. The ratio of magnetic field at the centre of a current carrying circular coil to its magnetic moment is 'x' if the current and the radius both are doubled. The new ratio will become

a) 2x b) 4x c) $\frac{x}{4}$ d) $\frac{x}{8}$

Ans. d

Sol. $\frac{B}{M} = \frac{(\mu_0 IN / 2r)}{NI\pi r^2}$

$\frac{B}{M} = \alpha \frac{1}{r^3}$

$x = \frac{B}{M} \quad (let)$

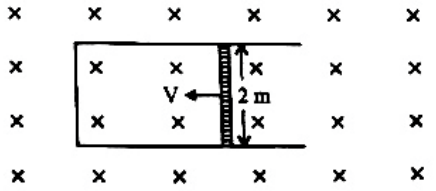
$\frac{x_2}{x} = \left(\frac{r}{2r}\right)^3 = \frac{x}{8}$

30. In a permanent magnet at room temperature
a) Magnetic moment of each molecule is zero
b) The individual molecules have non-zero magnetic moment which are all perfectly aligned
c) Domains are partially aligned
d) Domains are all perfectly aligned

Ans. c

Sol. Due to thermal hesitation, domains are partially aligned.

31. A rod of length 2 m slides with a speed of 5 ms^{-1} on a rectangular conducting frame as shown in figure. There exists a uniform magnetic filed of 0.04 T perpendicular to the plane of the figure. If the resistance of the rod is 3Ω. The current through the rod is



a) 75 mA b) 133 mA c) 0.75 A d) 1.33 A

Ans. b

Sol. $i = \frac{Blv}{R} = \frac{0.04 \times 2 \times 5}{3}$

$= 133\,mA$

32. The current in a coil of inductance 0.2 H changes from 5A to 2A in 0.5sec. The magnitude of the average induced emf in the coil is

a) 0.6 V b) 1.2 V c) 30 V d) 0.3 V

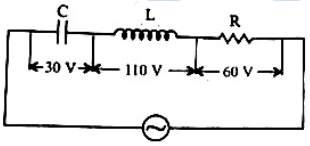
Ans. b

Sol. $e = L\frac{di}{dt}$

$= 0.2\left(\frac{5-2}{0.5}\right)$

$= \frac{2}{5} \times 3 = 1.2\ V$

33. In the given circuit the peak voltage across C, L and R are 30 V, 110 V and 60 V respectively. The rms value of the applied voltage is



a) 100 V b) 200 V c) 70.7 V d) 141 V

Ans. c

Sol. $V_0 = \sqrt{V_R^2 + (V_L - V_C)^2}$

$= \sqrt{(60)^2 + (110-30)^2}$

$= 100$

$V_{rms} = \frac{V_0}{\sqrt{2}} = \frac{100}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$

$= 100\left(\frac{\sqrt{2}}{2}\right)$

$= 100\left(\frac{1.414}{2}\right)$

$= 70.7\ V$

34. The power factor of R-L circuit is $\frac{1}{\sqrt{3}}$. If the inductive reactance is 2Ω. The value of resistance is

a) 2Ω b) $\sqrt{2}\,\Omega$ c) $0.5\,\Omega$ d) $\frac{1}{\sqrt{2}}\Omega$

Ans. b

Sol. $\cos\phi = \frac{1}{\sqrt{3}}$

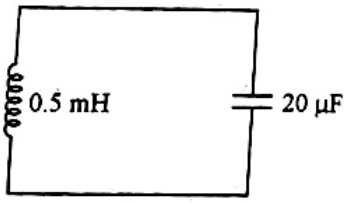
$\tan\phi = \frac{\sqrt{2}}{1}$

$\tan\phi = \frac{X_L}{R}$

$\sqrt{2} = \frac{2}{R}$

$R = \frac{2}{\sqrt{2}} = \sqrt{2}\ \Omega$

35. In the given circuit, the resonant frequency is



a) 15.92 Hz b) 159.2 Hz
c) 1592 Hz d) 15910 Hz

Ans. c

Sol. $V = \frac{1}{2\pi\sqrt{LC}}$

$= \frac{1}{2\pi\sqrt{0.5\times10^{-3}\times20\times10^{-6}}}$

$= 1592$ Hz

36. A light beam of intensity 20 W/cm^2 is incident normally on a perfectly reflecting surface of sides 25 cm×15 cm. The momentum imparted to the surface by the light per second is

a) 2×10^{-5} kg ms^{-1} b) 1×10^{-5} kg ms^{-1}
c) 5×10^{-5} kg ms^{-1} d) 1.2×10^{-5} kg ms^{-1}

Ans. c

Sol. $I = \frac{E}{A}$

$E = IA$

$P = \frac{2E}{C}$

$P = \frac{2IA}{C}$

$= \frac{2\times20\times25\times15}{3\times10^{8}}$

$= 5\times10^{-5}$ kg ms^{-1}

37. An object approaches a convergent lens from the left of the lens with a uniform speed 5 m/s and stops at the focus, the image

a) Moves away from the lens with an uniform speed 5 m/s

b) Moves away from the lens with an uniform acceleration

c) Moves away from the lens with a non-uniform acceleration

d) Moves towards the lens with a non-uniform acceleration

Ans. c

Sol. Moves away from the lens with a non-uniform acceleration.

38. The refracting angle of prism is A and refractive index of material of prism is $\cot\frac{A}{2}$. The angle of minimum deviation is

a) $180^0 - 3A$ b) $180^0 + 2A$
c) $90^0 - A$ d) $180^0 - 2A$

Ans. d

Sol. $n = \frac{\sin\left(\frac{A+d_m}{2}\right)}{\sin\frac{A}{2}}$

$\cot\frac{A}{2} = \frac{\sin\left(\frac{A+d_m}{2}\right)}{\sin\frac{A}{2}}$

$\frac{\cos\frac{A}{2}}{\sin\frac{A}{2}} = \frac{\sin\left(\frac{A+d_m}{2}\right)}{\sin\frac{A}{2}}$

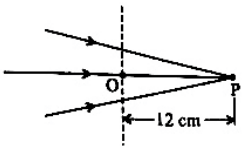
$\sin\left(90-\frac{A}{2}\right) = \sin\left(\frac{A+d_m}{2}\right)$

$90 - \frac{A}{2} = \frac{A+d_m}{2}$

$180 - A - A = d_m$

$180 - 2A = d_m$

39. The following figure shows a beam of light converging at point P. When a concave lens of focal length 16 cm is introduced in the path of the beam at a place shown by dotted line such that OP becomes the axis of the lens, the beam converges at a distance x from the lens. The value of x will be equal to



a) 12 cm b) 24 cm c) 36 cm d) 48 cm

Ans. d

Sol. $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$ f=16 cm, u= 12 cm

40. Three polaroid sheets P_1, P_2 and P_3 are kept parallel to each other such that the angle between pass axes of P_1 and P_2 is 45^0 and that between P_2 and P_3 is 45^0. If unpolarised beam of light of intensity 128 Wm^{-2} is incident on P_1. What is the intensity of light coming out of P_3?

a) 128 Wm^{-2} b) 0
c) 16 Wm^{-2} d) 64 Wm^{-2}

Ans. c

Sol. $I = \frac{I_0}{2}\left(\cos^2\theta\right)^2$

41. Two poles are separated by a distance of 3.14 m. The resolving power of human eye is 1 minute of an arc. The maximum distance from which he can identify the two poles distinctly is

a) 10.8 km b) 5.4 km c) 188 m d) 376 m

Ans. a

Sol. $\theta = \frac{d}{D}$

42. In young's Double Slit Experiment, the distance between the slits and the screen is 1.2 m and the distance between the two slits is 2.4 mm. If a thin transparent mica sheet of thickness 1 μm and R.I. 1.5 is introduced between one of the interfering beams, the shift in the position of central bright fringe is

a) 2 mm b) 0.5 mm
c) 0.125 mm d) 0.25 mm

Ans. d

Sol. Shift $= (M-1)t\frac{D}{d}$ =0.25 mm

43. The de-Broglie wavelength associated with electron of hydrogen atom in this ground state is

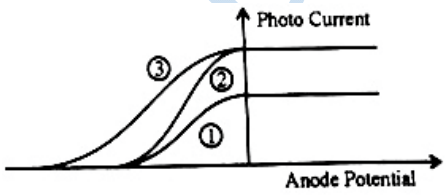
a) $0.3\,\mathring{A}$ b) $3.3\,\mathring{A}$ c) $6.26\,\mathring{A}$ d) $10\,\mathring{A}$

Ans. b

Sol. E=13.6 V

$$\lambda = \frac{12.27}{\sqrt{13.6}} = \frac{12.27}{3.68} = 3.33A^0$$

44. The following graph represents the variation of photo current with anode potential for a metal surface. Here I_1, I_2 and I_3 represents intensities and γ_1, γ_2, γ_3 represent frequency for curves 1, 2 and 3 respectively, then



a) $\gamma_1 = \gamma_2$ and $I_1 \neq I_2$ b) $\gamma_1 = \gamma_3$ and $I_1 \neq I_3$
c) $\gamma_1 = \gamma_2$ and $I_1 = I_2$ d) $\gamma_2 = \gamma_3$ and $I_1 = I_3$

Ans. a

Sol. Stopping potential same

So frequencies same $(r_1 = r_2)$

Currents are different

So intensity are different

$I_1 \neq I_2$

45. The period of revolution of an electron revolving in n^{th} orbit of H-atom is proportional to

a) n^2 b) $\frac{1}{n}$
c) n^3 d) Independent of n

Ans. c

Sol. $T \alpha n^3$

46. Angular momentum of an electron in hydrogen atom is $\frac{3h}{2\pi}$ (h is the Planck's constant). The K.E. of the electron is

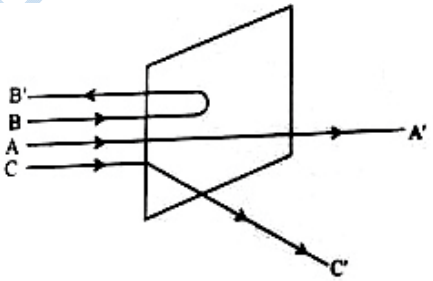
a) 4.35 eV b) 1.51 eV c) 3.4 eV d) 6.8 eV

Ans. b

Sol. $mvr = \frac{nh}{2\pi}$

n=3

47. A beam of fast moving alpha particles were directed towards a thin film of gold. The parts A, B and C of the transmitted and reflected beams corresponding to the incident parts A, B and C of the beam are shown in the adjoining diagram. The number of alpha particles in



a) B' will be minimum and in C' maximum
b) A' will be maximum and in C' minimum
c) A' will be minimum and in B' maximum
d) C' will be minimum and in B' maximum

Ans.

Sol. A' will be maximum

B' will be Minimum

48. Two protons are kept at a separation of 10 nm. Let F_n and F_e the nuclear force and the electromagnetic force between them

a) $F_e = F_n$
b) $F_e >> F_n$
c) $F_e << F_n$
d) F_e and F_n differ only slightly

Ans. b

Sol. Conceptual

49. During a β^- decay
a) An atomic electron is ejected
b) An electron which is already present within the nucleus is ejected
c) A neutron in the nucleus decays emitting an electron
d) A proton in the nucleus decays emitting an electron

Ans. c

Sol. A neutron in the nucleus decays emitting an electron

50. A radio-active elements has half-life of 15 years. What is the fraction that will decay in 30 years?
a) 0.25 b) 0.5 c) 0.75 d) 0.85

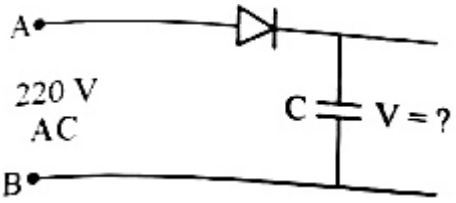
Ans. c

Sol. Fraction of remaining element

$$\left(1-\frac{N}{N_0}\right)\times 100=\left(\frac{1}{2}\right)^{t/T}\times 100=0.25$$

The fraction that will decay in 30 years is 0.75

51. A 220 V A.C supply is connected between points A and B as shown in figure what will be the potential difference V across the capacitor?



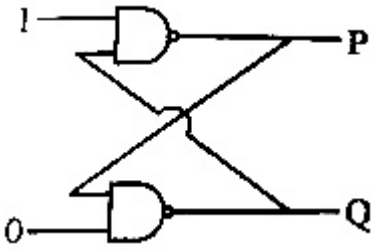
a) 220 V b) 110 V
c) 0 d) $220\sqrt{2}$ V

Ans. d

Sol. The potential difference a cross the capacitor is peak voltage.

$$V_{max}=V_{rms}\times\sqrt{2}=220\sqrt{2}V$$

52. In the following circuit what are P and Q:



a) P = 1, Q = 0 b) P = 0, Q = 1
c) P = 0, Q = 0 d) P = 1, Q = 1

Ans. b

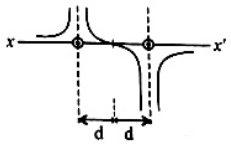
Sol. P=0, Q=1

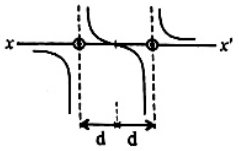
53. A positive hole in a semiconductor is
a) An anti-particle of electron
b) A vacancy created when an electron leaves a covalent bond
c) Absence of free electrons
d) An artificially created particle

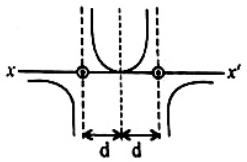
Ans. b

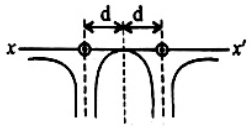
Sol. A vacancy created when an electron leaves a covalent bond.

54. Two long straight parallel wires are a distance 2 d part. They carry steady equal currents flowing out of the plane of the paper. The variation of magnetic field B along the line xx' is given by

a) 

b) 

c) 

d) 

Ans. b

Sol. $B=\frac{\mu_0 i}{2\pi r}$

$B\alpha\frac{1}{r}$

55. A cylindrical wire has a mass (0.3 ± 0.003)g, radius (0.5 ± 0.005)mm and length (6 ± 0.06)cm. The maximum percentage error in the measurement of its density is
a) 1 b) 2 c) 3 d) 4

Ans. d

Sol. $d=\frac{m}{v}=\frac{m}{\pi r^2 l}$

$$\frac{\Delta d}{d}\times 100\%=\frac{\Delta m}{m}\times 100\%+2\frac{\Delta r}{r}\times 100\%+\frac{\Delta l}{l}\times 100\%=4$$

56. At a metro station, a girl walks up a stationary escalator in 20 sec. If she remains stationary on the escalator, then the escalator take her up in 30 sec. The time taken by her to walk up on the moving escalator will be
a) 25 sec b) 60 sec c) 12 sec d) 10 sec

Ans. c

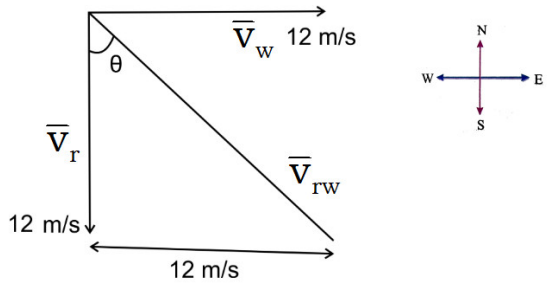
Sol. $t=\frac{t_1 t_2}{t_1+t_2}=12$

57. Rain is falling vertically with a speed of 12 ms^{-1}. A woman rides a bicycles with a speed of 12 ms^{-1} in east to west direction. What is the direction in which she should hold her umbrella?

a) 30^0 towards East b) 45^0 towards East
c) 30^0 towards West d) 45^0 towards West

Ans. b

Sol.



$$\tan\theta = \frac{|v_r|}{|v_m|} = \frac{12}{12} = 1$$

$\theta = 45^0$ towards east

58. One end of a string of length ' l ' is connected to a particle of mass 'm' and the other to a small peg on a smooth horizontal table. If the particle moves in a circle with speed 'v', the net force on the particle (directed towards the centre) is : (T is the tension in the string)

a) T b) $T - \frac{mv^2}{l}$

c) $T + \frac{mv^2}{l}$ d) 0

Ans. a

Sol. The net force on the particle (directed towards the centre) is tension (T) in the string

59. A body is initially at rest. It undergoes one-dimensional motion with constant acceleration. The power delivered to it at time 't' is proportional to

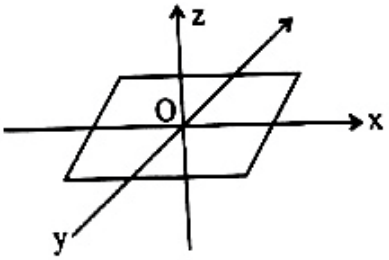
a) $t^{1/2}$ b) t c) $t^{3/2}$ d) t^2

Ans. b

Sol. $P = \frac{1}{2}\frac{mv^2}{t} = \frac{1}{2}\frac{m\times(at)^2}{t}$

$p\alpha t$

60. A thin uniform rectangular plate of mass 2 kg is placed in X-Y plane as shown in figure. The moment of inertial about x-axis is $I_x = 0.2$ kg m^2 and the moment of inertia about y-axis is $I_y = 0.3$ kg m^2. The radius of gyration of the plate about the axis passing through O and perpendicular to the plane of the plate is



a) 50 cm b) 5 cm c) 38.7 cm d) 31.6 cm

Ans. a

Sol. $I_z = I_x + I_y = 0.5\,Kg\ m^2$

$I = mK^2$

$K = 0.5\,m = 50cm$