



**Final Examination - Grade 13 - 2016**

**Index No. .... Physics I Two hours only**

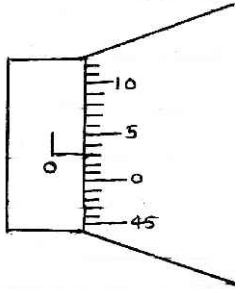
**Important**

- ◆ This paper consists of 50 questions.
- ◆ Answer all the questions.
- ◆ Use of calculator is not allowed.
- ◆ Write your Index number in the space provided in the answer sheet.
- ◆ In each of the questions 1 to 50, pick one of the alternatives form (1), (2), (3), (4), (5) which is correct or most appropriate and mark your response on the answer sheet with a cross (x) in the answer sheet.

01. The unit of the young modules of elasticity is?

1.  $Nm^{-1}$                       2.  $Ns^{-1}$                       3.  $NKg^{-1}$                       4.  $Nm^{-2}$                       5.  $NMs^{-1}$

02. When the spindle and anvil of a micro-mter screw gauge of least count 0.01mm are in contact, the scales are shown in the figure. When the thickness of glass slite measure, if the fractional error of correct reating is 1/242, the Final reating instrument is,



1. 2.39mm                      2. 2.40mm                      3. 2.45mm  
4. 2.47mm                      5. 2.49mm

03. 80g of piece of metal of specific heat capacity  $125Jkg^{-1}K^{-1}$  at  $100^{\circ}C$  is mixed with 100 g of water. If the final maximiu temperature of the water is  $37^{\circ}C$ . The initial temperature of the water is, (Specitic heat capacity of water is  $= 4200 Jkg^{-1}K^{-1}$ )

1.  $34^{\circ}C$                       2.  $34.5^{\circ}C$                       3.  $35^{\circ}C$                       4.  $35.5^{\circ}C$                       5.  $36.5^{\circ}C$

04. An astronomical telescope is normal adjust - consist of two lens focal lengths 100 cm and 5cm consider following statement about it?

- (A) The focal length of objective must be 100cm.
- (B) Eye ring is at 5.25 cm away from eyepiece.
- (C) Linear magnification is 20

Of the above statement,

1. Only (A) is true.                      2. Only (A) and (B) are true.

3. Only (A) and (C) are true.

4. Only (B) and (C) are true.

5. All (A), (B) and (C) are true.

05. The intensity level at a point created by 1000 identical sound source is 80dB to reduce the intensity level up to 70dB the number of sound sources that has to be disconnected is,

1. 100                      2. 10                      3. 990                      4. 900                      5. 999

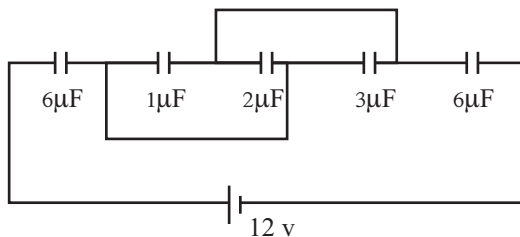
06. When an object is placed on principle axis 2cm away from the focus of convex lens, the image is formed 50cm away form the other focus, the focal length of lens is,

1. 5cm                      2. 10cm                      3. 12cm                      4. 20cm                      5. 30cm

07. The weight of water vessel is  $Mg$  when a rubber ball of mass  $m$ g is placed in to the vessel,  $\frac{3}{4}$ <sup>th</sup> of ball is submerged. If water is not flowed to out side. The weight of water vessel with floated ball is,

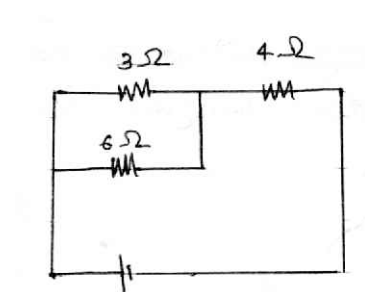
1.  $Mg$                       2.  $(M+m)g$                       3.  $(M - \frac{3}{4}m)g$                       4.  $(M + \frac{3}{4}m)g$                       5.  $(M - m)g$

08. In the circuit shown in the below, the electrical energy stored in the capacitance of  $2\mu F$  is.



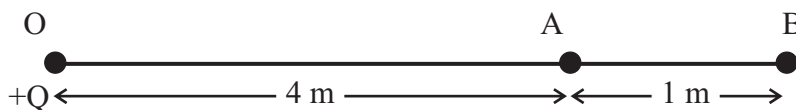
1.  $4\mu J$                       2.  $8\mu J$   
3.  $12\mu J$                       4.  $16\mu J$   
5.  $32\mu J$

09. In the circuit shown, if a current of 0.8 A flows through  $3\Omega$ , the potential different through  $4\Omega$  is.



1. 9.6 V                      2. 2.6 V  
3. 4.8 V                      4. 1.2 V  
5. 3.6 V

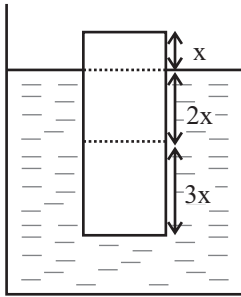
10. The electrical field intensity at point B is  $48 \text{ Nc}^{-1}$  due to the charge  $+Q$  kept at point O as shown in the figure. The electrical field intensity at point A is,



1.  $42 \times \text{NC}^{-1}$                       2.  $48 \times \text{NC}^{-1}$                       3.  $48 \times \text{NC}^{-1}$   
4.  $48 \times \frac{4}{5} \text{NC}^{-1}$                       5.  $48 \times \frac{5}{4} \text{NC}^{-1}$                        $\frac{25}{16}$   
 $\frac{16}{25}$                        $\frac{1}{4}$

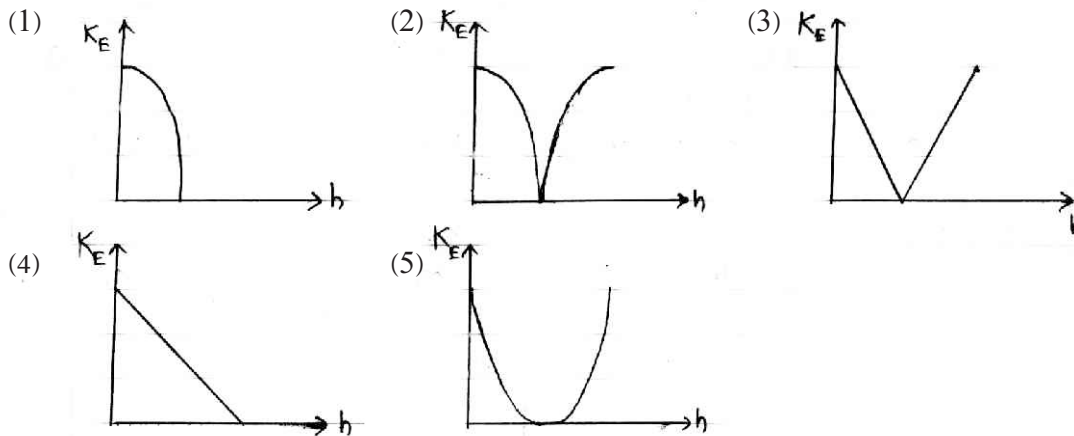
11. A wooden cylinder of uniform cross sectional area A floats in a large vessel which contains two

immiscible liquids having specific gravity 1.0 and 0.6 as shown in the figure. The mass required to keep on top of the cylinder to immersed the cylinder up to upper edge is,



1.  $0.6 \times A$
2.  $1.0 \times A$
3.  $4.2 \times A$
4.  $4.4 \times A$
5.  $5.2 \times A$

12. An object thrown upwards vertically with out rotation which of following graphs best represents the variation of its kinetic energy ( $K_E$ ) with height ( $h$ ) from ground. (neglect the air resistance)



13. The rate of water flow through the horizontal capillary tube in which connected to the constant pressure head is 'x'. The rate of water flow in the capillary tube of same length and half of the radius is,

1.  $X/32$
2.  $X/16$
3.  $X/8$
4.  $X/4$
5.  $X/2$

14. If the conducting sphere of radius R having a uniform surface charge density  $\sigma$ , The electric field intensity on the surface is.

1.  $\sigma/RE_0$
2.  $\sigma/R^2E_0$
3.  $\sigma/E_0$
4.  $\sigma R/E_0$
5.  $\sigma R^2/E_0$

15. The rate of steady, streamline flow of a liquid through a capillary tube not depend on,

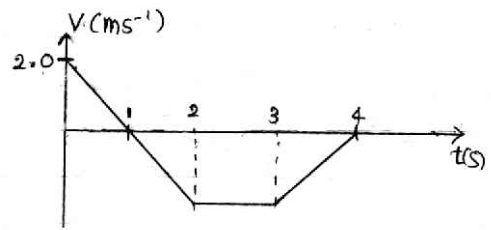
1. Radius of tube.
2. length of tube
3. Viscosity coefficient between two ends of the tube.
4. The pressure difference between two ends of the tube.
5. density of the liquid.

16. An open tube length 20cm is sounded with the frequency of 1700Hz. The overtone of the above sound is. (The velocity of sound in air is  $340\text{ms}^{-1}$ )

1. First            2. Second            3. Third            4. Forth            5. Fifth

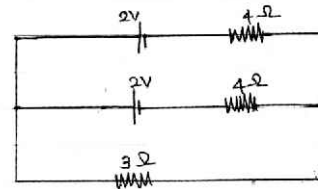
17. The figure shows the velocity - time graph for a moveable object. The distance between initial position and final position is,

1. 1m                    2. 3m                    3. 4m  
4. 5m                    5. 6m



18. Two cells of 2V and negligible internal resistance are connected as shown in the figure. The dissipation of energy through the resistance  $3\Omega$  for 100s is.

1. 12J                    2. 48J                    3. 53.3J  
4. 97J                    5. 120J



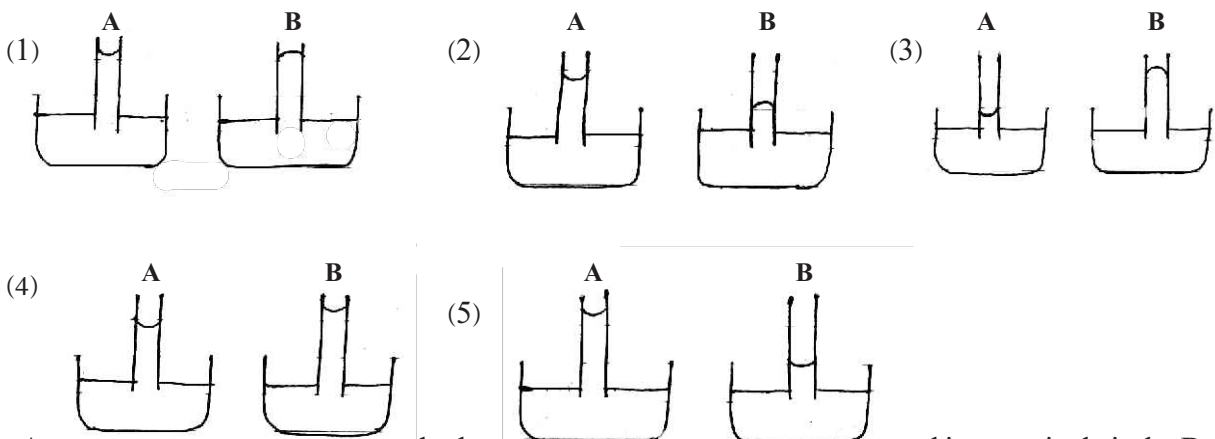
19. When a tuning fork of frequency 480Hz and sonometer wire are sounded together, 6 beats were heard. When one prong of tuning fork is loaded with a piece of plasticine, the beat frequency is reduced up to 4, the frequency of sonometer wire is,

1. 474 Hz            2. 476 Hz            3. 478 Hz            4. 482 Hz            5. 486Hz

20. The loudspeaker which produce steady sound of 220Hz is kept facing at vertical wall. The distance between sound source and wall is 21m. There are sequences of maximum and minimum sound values between above gap. When velocity of sound is  $330\text{ms}^{-1}$  the gap between any consecutive maximum sound intensity value is,

1.  $\frac{3}{2}$  m                    2.  $\frac{3}{4}$  m                    3. 10.47 m                    4. 0.095 m                    5.  $\frac{2}{3}$  m

21. Two identical capillary tubes A and B dips vertically in water and soap solution respectively. Which of the figures correctly indicate the levels of the liquid columns. (consider the densities of two liquids are equal)



22. A piece of heavy mass ring attached to a string fixed at both ends is rotated in a vertical circle. Before

break it, If the maximum affordable tension of string is 60N. The maximum velocity of piece of metal is. ( $g = 10\text{ms}^{-2}$ )

1.  $35\text{ms}^{-1}$       2.  $50\text{ms}^{-1}$       3.  $60\text{ms}^{-1}$       4.  $100\text{ms}^{-1}$       5.  $140\text{ms}^{-1}$

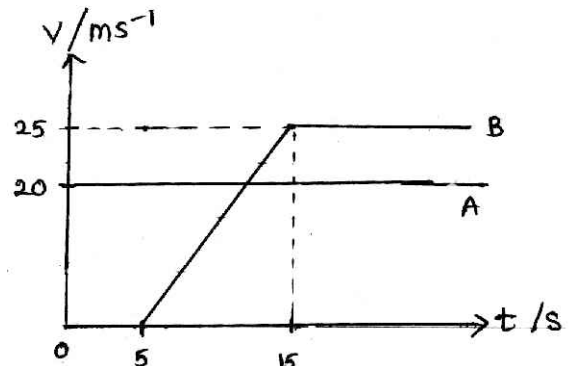
23. Consider following statements made about mercury - in - glass thermometer.

- (A) The sensitivity can be increased by decreasing the radius of capillary tube.  
 (B) The respond may be quirked by using cylindrical bulb behalf of the spherical bulb with out changing the volume.  
 (C) The accuracy can be increased by increasing the length of capillary.

of the above statements,

1. Only (A) is true      2. Only (A) and (B) are true.  
 3. Only (A) and (C) true.      4. Only (B) and (C) true.  
 5. All (A), (B) and (C) are true.

24. A motor car A passes a police bike B stopped by the side of the road. After 5 seconds the police bike B follows the motor car A. The following v-t graph shows the motion of the police bike following the motor car A, when the police bike B captures the motor car, the displacement of A from th initial position of B is,



1. 400m      2. 700m  
 3. 900m      4. 1000m      5. 1200m

25. When the speed of sound in air is  $340\text{ms}^{-1}$  the frequencies of 100Hz, 300Hz, 500Hz,... are mode by a tube. If the end correction is negligible. Which of the following will be this tube.

1. An open of length 0.85m      2. An open tube of length 1.7 m.  
 3. A tube of length 0.85m and open at one end.      4. A tube of length 1.7m and open at one end.  
 5. A tube of length 3.4m and open at one end.

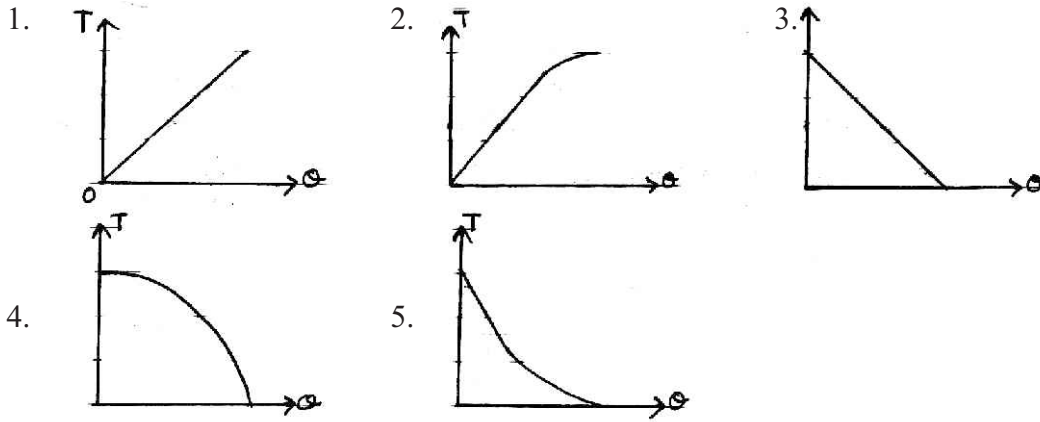
26. Consider the following waves,

- (A) A light waves emitted by Na lamp.  
 (B) X-rays emitted by X ray tube.  
 (C) Micro waves are used in system of radar.

The transverse waves from above waves are,

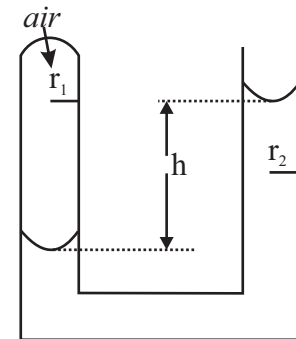
1. Only (A)      2. Only (A) and (B)      3. Only (B) and (C)  
 4. Only (A) and (C)      5. All (A), (B) and (C)

27. The variation of surface tension ( $T$ ) with temperature ( $\theta$ ) is best represented by,



28. J tube contains an air column trapped by a water column. The density and surface tension of water are  $\rho$  and  $T$  respectively. The radius of the limbs are  $r_1$  and  $r_2$  respectively. If the atmospheric pressure is  $\pi$ , the pressure of the trapped air is,

1.  $\pi + h\rho g - \frac{2T}{r_1} - \frac{2T}{r_2}$
2.  $\pi + h\rho g + \frac{2T}{r_1} - \frac{2T}{r_2}$
3.  $\pi + h\rho g + \frac{4T}{r_1} - \frac{4T}{r_2}$
4.  $\pi + h\rho g - \frac{2T}{r_1} + \frac{2T}{r_2}$
5.  $\pi + h\rho g - \frac{4T}{r_1} - \frac{4T}{r_2}$



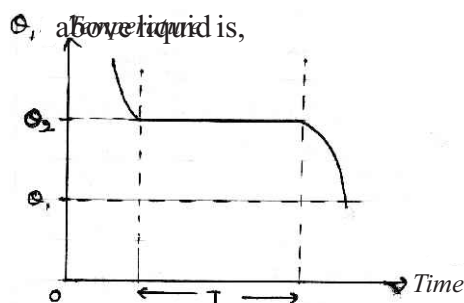
29. When an object is suspended by a string, the extension of the string is 1 mm. When the same object is suspended by a string of same material, length and breadth are twice than first one, the new extension length is,

1. 0.25 mm
2. 0.5 mm
3. 1 mm
4. 2 mm
5. 4 mm

30. A milliammeter having an internal resistance  $12\Omega$  that reads  $0.01A$  for a full scale reading. To use it as a voltmeter of range  $3V$ . the resistance that must be connected in series with it will be,

1.  $102\Omega$
2.  $288\Omega$
3.  $300\Omega$
4.  $412\Omega$
5.  $518\Omega$

31. The graph shows the cooling curve of a liquid. The specific heat capacities of liquid at solid state and liquid state are  $S_1$  and  $S_2$  respectively. If the rates of decreasing temperature before moment of solidification and after moment of solidification are  $r_1$  and  $r_2$  respectively. The latent heat of fusion



1.  $\frac{r_1 S_2 + r_2 S_1}{2} T$
2.  $(r_1 S_1 + r_2 S_2) T$
3.  $\left(\frac{r_1 S_1 + r_2 S_2}{2}\right) (\theta_1 - \theta_2) T$
4.  $r_1 S_1 + r_2 S_2 (\theta_2 - \theta_1) T$

5.  $r_1 + r_2 \quad s_1 + s_2$

32. Consider the following statements.  
 (A) Plunking a stretched string fixed at both ends.  
 (B) Vibration in air column in a tube closed at one end.  
 (C) A musical note passing through air to listener from violin.

Which of the above waves shows the all characteristics of longitudinal, progressive and mechanical.

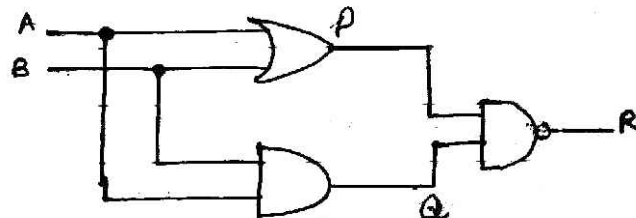
1. Only (A)                      2. Only (B)                      3. Only (C)  
 4. Only (A) and (B)            5. Only (A) and (C)

33. There is a wall in the room made by bricks in which area A and thickness of the bricks  $x_1$ , the thickness of the plaster at the wall is  $x_2$  and its thermal conducting is  $k_2$ . The temperature difference between inside and outside of the room is  $\theta$ . If the heat transforming through the wall within a unit time is Q.

Q is equal to,  $Q = \frac{A\theta}{\frac{x_1}{k_1} + \frac{x_2}{k_2}}$                       1.  $Q = \frac{A\theta}{\frac{x_1}{k_1} - \frac{x_2}{k_2}}$                       2.  $Q = \frac{A\theta}{\frac{k_1}{x_1} - \frac{k_2}{x_2}}$                       3.

1.  $Q = \frac{A}{\frac{k_1}{x_1} - \frac{k_2}{x_2}}$                       2.  $Q = A\theta \left[ \frac{k_1}{x_1} + \frac{k_2}{x_2} \right]$                       3.

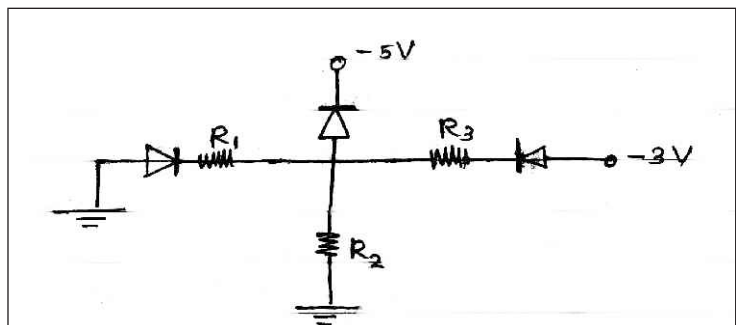
4.                                      5.



34.

When 1 and 0 inputs are given in to A and B respectively. The values of P, Q and R respectively.

1. 1,1,0                      2. 1, 0, 1  
 3. 0,1,1                      4. 0, 0, 1  
 5. 0, 1, 0



35. The magnetites of residences ( $R_1, R_2$  and  $R_3$ ) shown in the diagram are kilo ohms volumes, The responsible current.

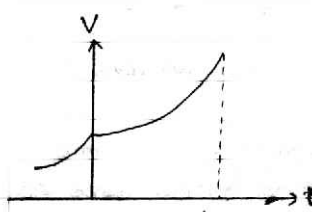
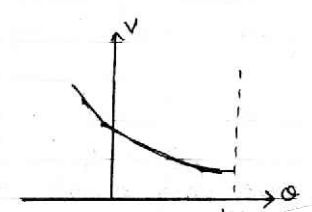
1. are in through only  $R_1$  and  $R_3$   
 2. are in through only  $R_2$  and  $R_3$

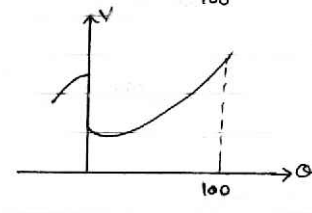
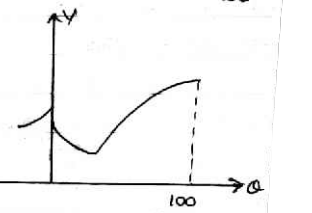
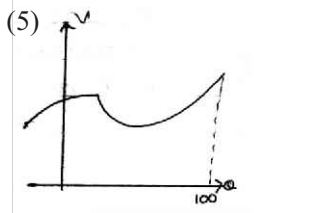
3. are in through only  $R_1$  and  $R_2$
4. are in all  $R_1, R_2$  and  $R_3$
5. are not in any resistance.

36. When electrons of de-broglie wave length  $\lambda$  falls on the target metal in the x-ray tube. If the minimum wave length ( $\lambda_m$ ) of x-rays created in the x ray tube is, (plank constant - h, mass of a electron - m, speed of light is C)

1.  $\lambda_m = 2mc\lambda^2 / h$
2.  $\lambda_m = 2 h / mc$

37. A b  
foll

(1)  (2) 

(3)  (4)  (5) 

=  $\lambda$   
10<sup>0</sup>C which of the

38. An object is kept on inclined surface with an angle of inclination  $45^\circ$ . The time taken to slide is  $\gamma$  times as much to slide on a rough incline plane than on a smooth incline. The coefficient of kinetic friction is,

1.  $1 - \frac{1}{\gamma^2}$
2.  $\frac{1}{1 - \gamma^2}$
3.  $\sqrt{1 - \frac{1}{\gamma}}$
4.  $\frac{1}{\sqrt{1 - \gamma^2}}$
5.  $\frac{1}{1 + \gamma^2}$

39. The atoms of a radioactive element with half life time 3 years, is  $8 \times 10^{25}$ , the time taken to reduce non disintegration atoms up to  $1 \times 10^{25}$  is,

1. one year
2. Three years.
3. six years
4. nine years
5. 27 years.

40. water, containing in vessell is vapourized in a certain rate under atmospheric pressure. The rate of vapourization of water when the vesell is kept in the vacuum is,

1. Increased
2. decreased
3. remain constant
4. changed due to acceleration due to gravity.
5. fluctuation can not be described definitely.

41. The current in a metal conductor is increase from 1A to 2A. Which of the following statements is correctly described the mechanism inside the metal, when the current is increasing.

1. The number of electrons carrying current is constant while its drift velocity will increase.
2. The number of electrons are increased while its drift velocity will increase.



3. The number of electrons are increased while its drift velocity will constant.
4. The number of electrons and drift velocity are constant but collisions among electrons are decreased.
5. Both number of electrons and drift velocity of electrons are constant while collisions among electrons are decreased.

42. Consider the following statements made about inter reaction of matter and electromagnetic rays.

- (i) Absorption                      (ii) Spontaneous emission                      (iii) Stimulating emission

The main process which produce non coherent normal light beam from above is / are.

1. only (i)  $\left(\frac{Q}{\sigma}\right)^{1/4}$
2.  $\left(\frac{Q}{\sigma}\right)^{1/2}$  Only (i) and (ii)  $\left(\frac{Q}{\sigma}\right)$
3. Only (iii)  $\left(\frac{Q}{\sigma}\right)^2$
4. only (ii) and (iii)
5. Non of the above

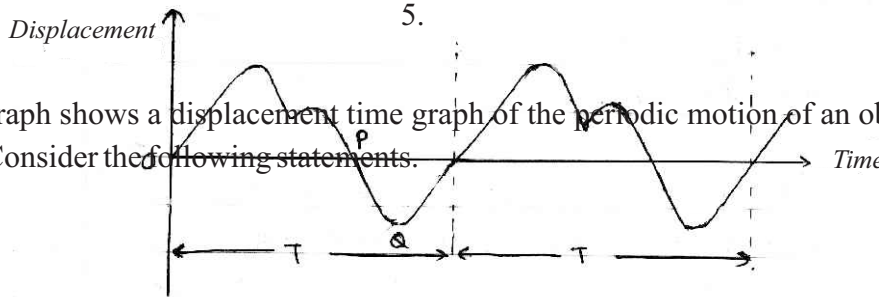
43. The sun radiate energy at the rate of Q per unit surface area. Assuming the to be a black body. Its surface temperature is given by ( $\sigma$  – Stefan constant)

1.  $V_2 = V_1 \left[ \frac{2\sigma - \rho}{\sigma - \rho} \right]$
2.  $V_2 = V_1 \left[ \frac{\sigma - \rho}{2\sigma - \rho} \right]$
3.  $V_2 = V_1 \left[ \frac{\sigma - 2\rho}{\sigma - \rho} \right]$
4.  $V_2 = V_1 \left[ \frac{\sigma - \rho}{\sigma - 2\rho} \right]$
5.  $V_2 = V_1 \left[ \frac{\sigma - 2\rho}{\sigma - \rho} \right]$

44. The terminal velocity of small sphere of density  $\sigma$  is  $V_1$ , When it released in viscus medium of density  $\rho$ . If the terminal velocity of second sphere of same radius and density  $2\sigma$  is  $V_2$  in the same medium of density  $\rho$ ,  $V_2$  is equal to.

1.  $V_2 = V_1 \left[ \frac{2\sigma - \rho}{\sigma - \rho} \right]$
2.  $V_2 = V_1 \left[ \frac{\sigma - \rho}{2\sigma - \rho} \right]$
3.  $V_2 = V_1 \left[ \frac{\sigma - 2\rho}{\sigma - \rho} \right]$
4.  $V_2 = V_1 \left[ \frac{\sigma - \rho}{\sigma - 2\rho} \right]$
5.  $V_2 = V_1 \left[ \frac{\sigma - 2\rho}{\sigma - \rho} \right]$

45. The graph shows a displacement time graph of the periodic motion of an object along the straight line. Consider the following statements.



- (A) Acceleration is zero at the point 'P'.
- (B) Acceleration is zero at the point 'Q'
- (C) Acceleration becomes zero 3 times in one cycle.
- (D) Velocity becomes zero more than 3 times in one cycle.
- (E) An object is subjected to simple harmonic motion.

At the above statements,

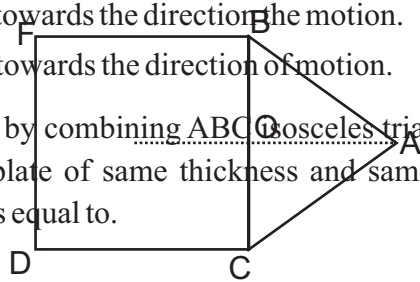
1. (A) and (C) are true.
2. (A) and (D) are true.
3. (B) and (D) are true.
4. (D) and (E) are true.
5. (B) and (C) are true.

46. A motor car which all the windows are shut moves along a horizontal road. A balloon filled with coal gas (weight less than air) is tied to seat by a child. At a certain instance, the string of the balloon stretched to the direction of the motion of the motor car.

According to the above observations, the motion of the motor car is,

1. Motor car taken a left bent while moving constant speed.
2. Motor car taken a right bend while moving constant speed.
3. Motor car moves along a string line with constant speed,
4. Motor car accelerate the towards the direction the motion.
5. Motor car decelerate the towards the direction of motion.

47. A compound object is made by combining ABC isosceles triangular plate of base 'a' and height 'h' and BCDE square shaped plate of same thickness and same material. The centre of gravity of compound object is at O, 'h' is equal to.



$$\sqrt{3} a$$

$$\frac{a}{\sqrt{3}}$$

$$\sqrt{2} a$$

$$\frac{a}{\sqrt{2}}$$

$$\sqrt{\frac{3}{2}} a$$

- 1.
- 2.
- 3.
- 4.
- 5.

48. A motor car moves with a speed of  $30\text{ms}^{-1}$  sounding its horn emitting a note of  $100\text{Hz}$ . If the speed of sound in air is  $330\text{ms}^{-1}$ , the frequency of the sound heard by the observer is,

1.  $360\text{Hz}$
2.  $300\frac{2}{3}\text{Hz}$
3.  $238.3\text{ Hz}$
4.  $220\text{Hz}$
5.  $110\text{Hz}$

49. The balance point obtains at the point D, when wire of length  $l$  is connected to the 'X' gap of the meter bridge. The balance point is reach to point E, when the wire made by the same material of length  $2l$  and same diameter is connected with parallel to the first one in x gap. The length AE is,

1.  $75\text{ cm}$
- 2.
3.  $60\text{ cm}$
4.  $40\text{cm}$
5.  $25\text{cm}$

50. A bullet is fired with certain angle to the horizontal direction . At the highest position in its path is explodes in to two pieces of equal masses A and B. The horizontal distance between highest point and initial point is 'x'. If the piece of A retraces it initial fired position. The distance between initial