QUBEE ACADEMY

EUEE

ANSWER KEY(PDF)

EUEE PHYSICS 2011/2019

ANSWER WITH EXPLANATION(PDF)

IF YOU WANT

MATHS,APTITUDE,CHEMISTRY EUEE ANSWER(PDF) AND MATHS,CHEMISTRY,PHYSICS MODEL (addisababa) EXAM ANSWER(PDF)

JOIN OUR TELEGRAM

CHANNEL"@qubeeacademy"

"Do all the good you can,
By all the means you can,
In all the ways you can,
In all the places you can,
At all the times you can,
To all the people you can,
As long as ever you can."

1. Two forces $\overrightarrow{F_1}$ =3i N and $\overrightarrow{F_2}$ =4jN are acting on a particle of mass m. What is the magnitude and direction of a force that balances the two?

   (A) $\overrightarrow{F_{eq}}$ = 5N at 143^0 counterclockwise from $\overrightarrow{F_2}$
   (B) $\overrightarrow{F_{eq}}$ = 7N at 127^0 counterclockwise from $\overrightarrow{F_1}$
   (C) $\overrightarrow{F_{eq}}$ = 7N at 127^0 counterclockwise from $\overrightarrow{F_2}$
   (D) $\overrightarrow{F_{eq}}$ = 5N at143^0 counterclockwise from $\overrightarrow{F_1}$

   SOLUTION: $F_N = \sqrt{3^2 + 4^2}$ = 5N , at an angle of $\Theta = \tan^{-1}(\frac{4}{3}) = 53^0$

   Since, the force that cancel this force is 5N at 143^0 from $\overrightarrow{F_2}$

   ANSWER: A

2. In playing room a turn table of radius 2m has moment of inertia 250Kgm^2 and is rotating about a frictionless vertical axel. When a boy of mass 50Khg stands near the rim, the system rotates with angular speed 3rad/s. The boy walks towards the center and stands at 1m from the axel. What is the final angular speed of the system?

   (A) 3rad/s (B) 2.5rad/s (C) 4.5rad/s (D) 5.4rad/s

   SOLUTION: from the conservation of angular momentum;

   $I_i\omega_i = I_f\omega_f$

   $[250 + 50(2)^2](3) = [250 + 50(1)^2](\omega_f)$

   ω_f = 4.5rad/s

   ANSWER: C

3. A thin circular ring of mass M and radius r and moment of inertia Mr^2 is rotating about its axis with a constant angular velocity ω. Two objects each of mass m, are attached gently to the opposite ends a diameter of the ring. What would be the angular velocity of the wheel?

   (A) $\frac{\omega M}{(M+m)}$ (C) $\frac{\omega(M+2m)}{M}$

   (B) $\frac{\omega(M+2m)}{(M+2m)}$ (D) $\frac{\omega M}{(M+2m)}$

   SOLUTION: from the conservation of angular momentum;

   $I_i\omega_i = I_f\omega_f$

   $Mr^2\omega = (M + 2m)r^2\omega_f$

   $\omega_f = \frac{\omega M}{(M+2m)}$

   ANSWER: D

4. Five beads of equal mass are fixed on a rigid light road that is free to rotate about a frictionless vertical bearing. The arrangement is such that, four of them are placed at 0.25m and the fifth one is at 0.5m from the axis of rotation. The rotational kinetic energy is 144$\mathcal{J}$ when the beads were rotating with angular speed of 48rad/s. What is the mass of each bead?

   (A) 0.5Kg (B) 0.25Kg (C) 0.75Kg (D) 1Kg

QUBEE ACADEMY

SOLUTION: $KE = \frac{1}{2}I^2\omega$ but $I = mr^2$

$$KE = \frac{1}{2}mr^2\omega = \frac{1}{2}[(4)(m)(0.25)^2 + m(0.5)^2](48^2)$$

$$144 = \frac{1}{2}[0.25m + 0.25m](2304)$$

$$144 = \frac{1}{2}[0.5m](2304)$$

$$144 = (0.25)(2304)m$$

$$\Rightarrow m = 0.25Kg$$

ANSWER: B

5. In which of the following case is no work done by dissipative force?
   (A) When a parachute jump from a pane
   (B) On a racing car that in a desert
   (C) For freely falling object
   (D) When someone slides a box on a horizontal rough surface

ANSWER: C

6. Which of the following is equal to the amount of work required to stop a moving object?
   (A) The kinetic energy of the object
   (B) The mass of the object times its acceleration
   (C) The square of the velocity of the object
   (D) The mass of the object times its velocity

EXPLANATION: a moving object has kinetic energy, thus the same amount of kinetic energy is Required to stop the object.

ANSWER: A

7. A 1Kg roller coaster is acted on by a 4N force over a displacement of 2m in the direction of force and then set free. The roller is moving on a smooth and horizontal surface towards a free a spring of constant K, whose other end is fixed on the wall. If the spring is compressed by 20cm to rest, then what is the value of the spring costant?
   (A) 100N/m (C) 800N/m
   (B) 200N/m (D) 400N/m

SOLUTION: Given F = 4N, S= 2m, ΔX =20cm =0.2m , K = ?

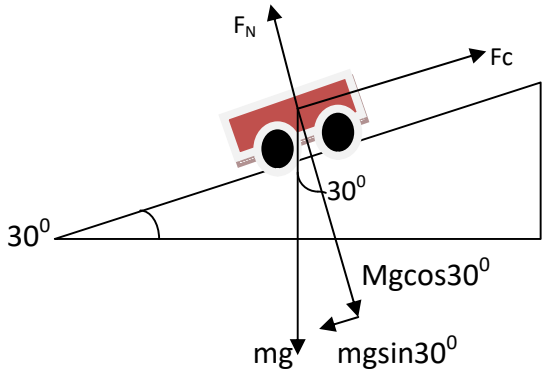
$$FS = \frac{1}{2}k(\Delta X)^2 \Rightarrow K = \frac{2FS}{(\Delta X)^2} = \frac{2X4X2}{(0.2)^2} = \frac{16}{0.04} = 400N/m$$

ANSWER: D

8. A trolley is set to move on a smooth track that is banked at an angle of 30^0. For a trolley moving with a speed 5m/s to round the curve, what is the radius of the banked surface?
   (A) 2.5m (B) 5.0m (C) 10m (D) 3.5m

QUBEE ACADEMY

SOLUTION: given v= 5m/s, Θ = 30^0



$\Rightarrow$ Fc - $mgsin30^0 = 0$

$\Rightarrow \frac{mv^2}{r} = mgsin30^0 \Rightarrow r = \frac{v^2}{gsin30^0} = \frac{5^2}{10xsin30^0} = 5m$

ANSWER: B

9. A grade 11 physics teacher ordered four of his students to measure the length of a class room. He provided them te following length measuring instruments. The instruments are meter rule with centimeter division, vernier calipers, micrometer screw gauge and meter tape with centimeter scale, but its zero reading is not visible. Which one of these instruments is appropriate for the task?

(A) Meter rule (C) Vernier calipers
(B) Micrometer screw gauge (D) Meter tape

ANSWER: A

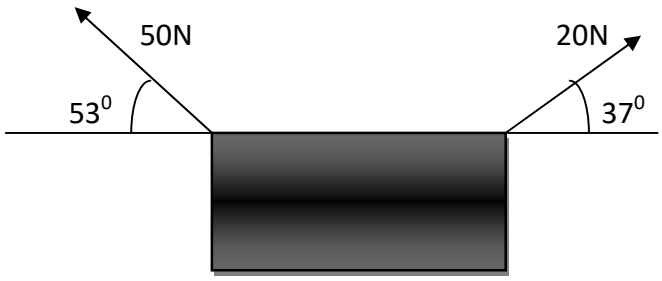
10. Which part of a scientific method report discusses the accuracy of measurements taken?

(A) Aim (B) Methods (C) Theory (D) Results

ANSWER: B

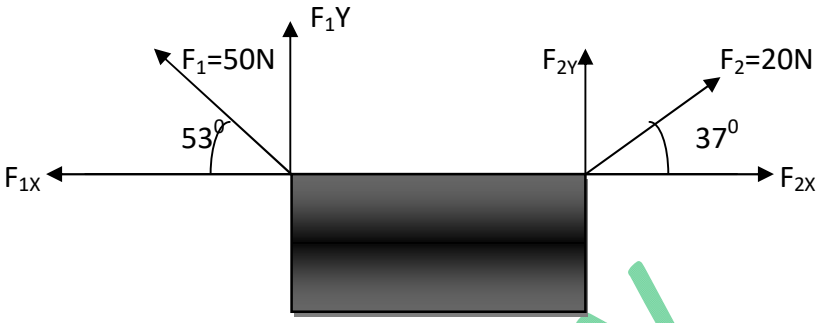
11. Two forces exerted on a block as shown in the figure below. What is horizontal component of the force?

(A) 14N,West
(B) 30N, West
(C) 70N, East
(D) 28N, West



QUBEE ACADEMY

SOLUTION:



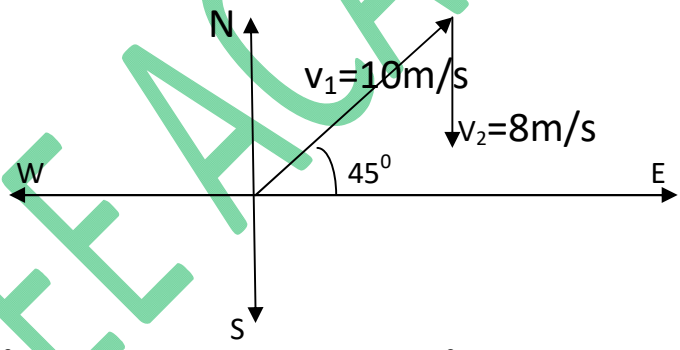
- Let assume east is positive and west is negative
  $F_{1X} = -F_1\cos53^0 = -50N\times\cos53^0 = -30N$, $F_{2X} = F_2\cos37^0 = 20N\times37^0 = 16N$
  $F_{netX} = F_{1X} + F_{2X} = -30N + 16N = -14N$ (or 14N West)

ANSWER: A

12. What is the magnitude of the resultant velocity for a bird flying first at a speed of 10m/s North East and then flying to South at a speed of 8m/s?

(A) 12.8m/s (C) 7.13m/s
(B) 16.6m/s (D) 7.07m/s

SOLUTION:



$V_{1Y} = 10\sin45^0 = 7.07m/s$, $v_{1X} = 10\cos450^0 = 7.07m/s$
$V_{NEt,Y} = 7.07\ m/s - 8m/s = -0.93m/s$(0.93 South)
$V_{NET,X} = V_{1X} = 7.07m/s$

$$V_{NET} = \sqrt{(v_{NET,X})^2 + (V_{NET,Y}^2)} = \sqrt{7.07^2 + (-0.93)^2} = 7.13m/s$$

ANSWER: C

13. Let **C** = **A X B** and $\Theta \neq 90^0$,where Θ is the smaller angle between **A** and **B** when they are drawn with their tails at same point. Which of the following is **NOT** true?

(A) **A. C** = 0 (C) /**C**/ =/**A**/ /**B**/ sinΘ
(B) **A.B** = 0 (D) –**C** = **B**X**A**

QUBEE ACADEMY

EXPLANATION: since **C**= **A X B , C** is perpendicular to both **A** and **B.**

Thus , **A. C** = 0.

A.B ≠ 0 Since, Θ ≠ 90^0

ANSWER: B

14. A driver of an automobile travelling at a constant speed of 20m/s suddenly applies a brake and the automobile comes to rest rest in 2.0 seconds after skidding for a certain distance. What is the length of the skid distance?

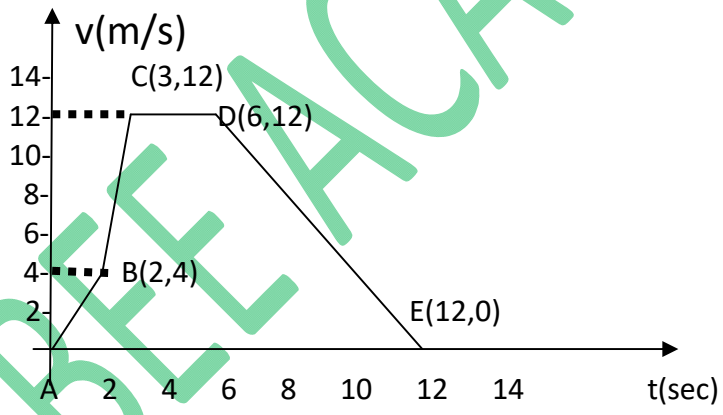
(A) 20m (B) 10m (C) 40m (D) 400m

EXPLANATION: Given u= 20m/s, v = 0m/s , t= 2s

$$S = \left(\frac{u+v}{2}\right)t = \left(\frac{20+0}{2}\right)(2) = 20m$$

ANSWER: A

15. Which of the following is correct about the motion shown in the velocity – time graph below?



(A) Between C and D, the motion is with constant accleleration.
(B) Between B and C, the acceleration is 4m/s^2.
(C) Total displacement is 84m.
(D) Between D and E , the motion is with constant positive acceleration.

EXPLANATION:

- Between C and D, the motion is with constant velocity , thus acceleration is zero.
- Between B and C , a = $\frac{\Delta v}{\Delta t} = \frac{12-4}{3-2}$ = 8m/s^2
- Total displacement is total Area under the graph
  Thus A = $\frac{1}{2}(2X4) + \frac{1}{2}(1X8) + 1X4 + 3X12 + \frac{1}{2}(6X12)$ = 84m

QUBEE ACADEMY

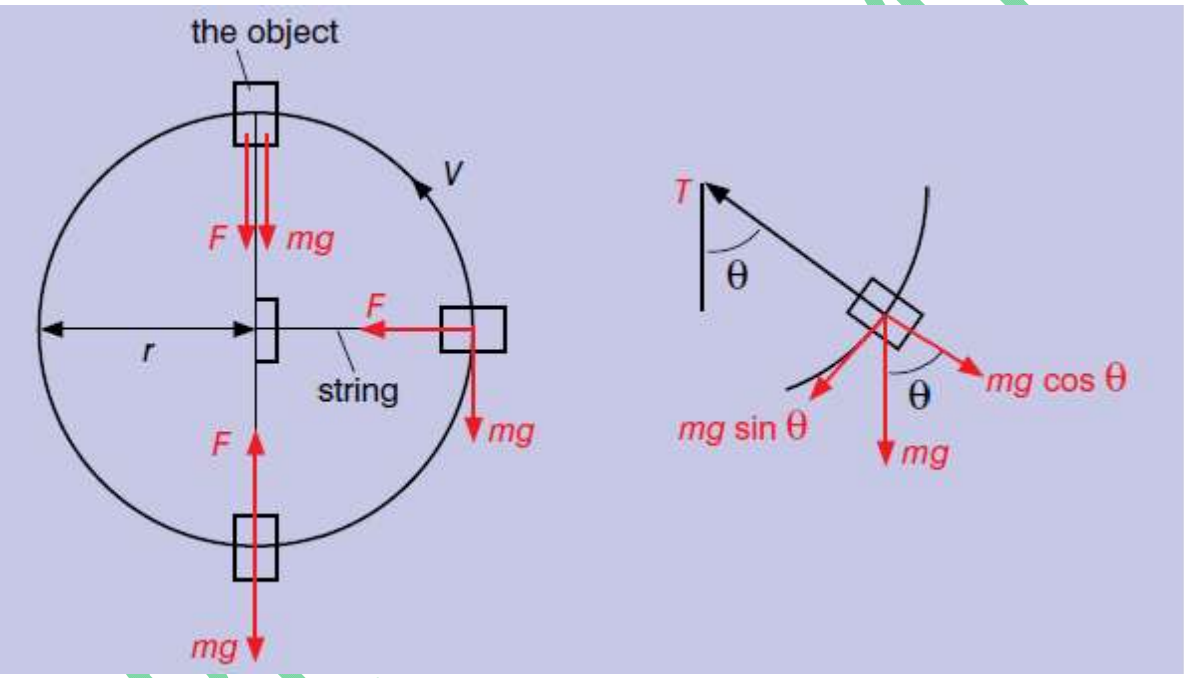
- Between D and E ,a= $\frac{\Delta v}{\Delta t}$ = $\frac{0-12}{12-6}$ = -2m/s^2

ANSWER: C

16. An object of mass M is set in a vertical circular motion. The tension T from the rope keeps the object in a circular path with speed v. Where does the rope experience a maximum tension?

(A) At the top of the circle
(B) When it is at 45^0 to the vertical line
(C) When the object is at half of the circle
(D) At the bottom of the circle

EXPLANATION:



The tension in the rope is given by:

$$T = \frac{mv^2}{r} + mg\cos\theta$$

At bottom of the circle θ = 0^0

$$T = \frac{mv^2}{r} + mgcos(0^0) = \frac{mv^2}{r} + \text{mg}$$

Since, the rope experience a maximum tension at the **BOTTOM** of the circle.

ANSWER: D

17. A shell is fired from a gun, whose barrel is inclined at an angle to the horizontal. During the flight, the shell explodes in air into fragments. The center of mass of different fragments will follow

(A) a horizontal straight line
(B) parabola

IF YOU WANT MATHS,APTITUDE,CHEMISTRY EUEE ANSWER(PDF) AND MATHS ,PHYSICS CHEMISTRY MODEL(ADDIS ABABA) EXAM ANSWER(PDF) JOIN OUR TELEGRAM CHANNEL "@qubeeacademy". THANK YOU!!!

(C) a vertical straight line
(D) an upredictable

EXPLANATION: since its inclined projection, center of mass of the fragment will follow parabola.

ANSWER: B

18. The rate of change of momentum of the raindrop can be given by F = ma + u $\frac{\Delta m}{\Delta t}$. In this expression what does u represent ?

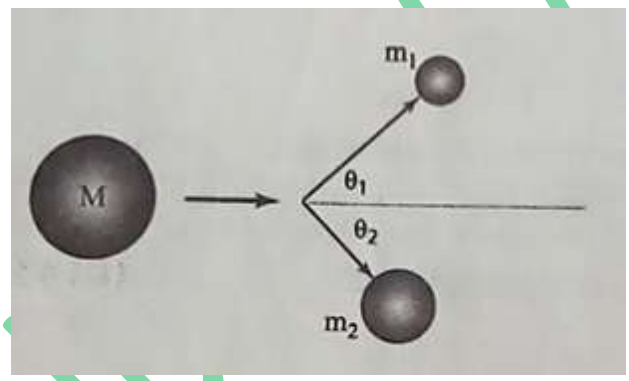
(A) The rate of change of the velocity for combined system
(B) The velocity of the rain drop
(C) The velocity of the loss in mass of raindrop
(D) The velocity of the extra mass added to the raindrop

EXPLANATION: The force acting on the raindrop at a certain time can be expressed as:

F = rate of change of momentum = ma + u $\frac{\Delta m}{\Delta t}$ where *F* is the force on the raindrop, *m* is the mass of the raindrop, ***u*** is the velocity of the extra mass that has been added to the raindrop .

ANSWER: D

19. A ball of mass M moves with speed V in the + X direction. I t explodes into two pieces that go off at angles of Θ_1 and Θ_2, as shown below.



(A) $P_1 = \frac{MV\cos\theta_2}{\sin(\theta_1+\theta_2)}$, and $P_2 = \frac{MV\cos\theta_1}{\sin(\theta_1+\theta_2)}$
(B) P_1 = MVtan Θ_2, and p_2 = MVtan Θ_1
(C) $P_1 = \frac{MV\sin\theta_2}{\sin(\theta_1+\theta_2)}$, and $p_2 = \frac{MV\sin\theta_1}{\sin(\theta_1+\theta_2)}$
(D) $P_1 = \frac{MV\cos\theta_2}{\cos(\theta_1+\theta_2)}$, and $P_2 = \frac{MV\cos\theta_1}{\cos(\theta_1+\theta_2)}$

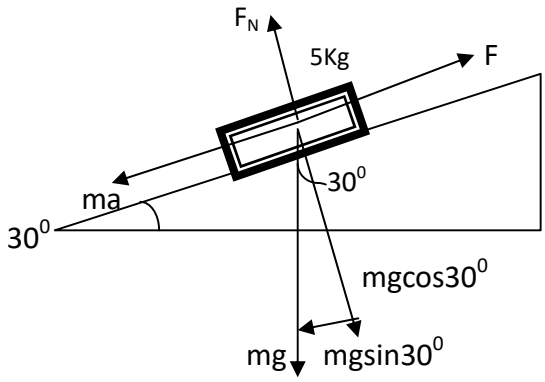
ANSWER: C

20. A 5Kg mass pushed upward along an inclined plane of inclinations 30^0 with constant force F. If the acceleration of the block for this motion is 1.0m/s^2 and the plane is assumed to be friction less, what is the magnitude of the constant force F?

(A) 30.0N (B) 25.0N (C) 20.0N (D)5.0N

IF YOU WANT MATHS,APTITUDE,CHEMISTRY EUEE ANSWER(PDF) AND MATHS ,PHYSICS CHEMISTRY MODEL(ADDIS ABABA) EXAM ANSWER(PDF) JOIN OUR TELEGRAM CHANNEL "@qubeeacademy". THANK YOU!!!

EXPLANATION:



$F = mgsin30^0 + ma$

$F = (5)(10)(\sin 30^0) + (5)(1)$

$F = 25N + 5N = 30N$

ANSWER: A

21. The statement of Kirchoff's point rule follows from:

(A) Dependence of resistance on temperature
(B) Conservation of energy
(C) Ohm's law
(D) Conservation of charge

EXPLANATION: Kirchoff's point rule states that the total current flowing into a point is equal to the total current flowing out the point.

This means , conservation of current in other word conservation of charge.

ANSWER: D

22. A metal rod is measured to have a resistance R. if the same metal rod is stretched to reduce its radius by half without affecting its density . What is its new resistance?

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

SOLUTION: Assume the metal before stretching has resistance R , radius r, length ℓ, volume V and after stretching has resistance R_1, radius r_1 , length ℓ_1, volume V_1.

Since the density is constant and the same metal is stretched mass is constant. Thus, volume is constant.

$V = V_1 \Longrightarrow A\ell = A_1\ell_1$, $A = \pi r^2$ and $A_1 = \pi {r_1}^2 = \pi(\frac{r}{2})^2$, since $r_1 = \frac{r}{2}$

$\Longrightarrow \pi r^2 \ell = \pi(\frac{r}{2})^2 \ell_1$

$\Longrightarrow \ell_1 = 4\ell$

Know, $R = \frac{\rho\ell}{\pi r^2}$ and,

$R_1 = \frac{\rho\ell_1}{A_1} = \frac{\rho x 4\ell}{\pi(\frac{r}{2})^2} = \frac{4\rho\ell}{\frac{\pi r^2}{4}} = \frac{16\rho\ell}{\pi r^2} = 16(\frac{\rho\ell}{\pi r^2}) = 16R$

QUBEE ACADEMY

ANSWER: B

23. A sheet of polythene (ε_r = 2.3) and 0.25mm thick is to be used in a capacitor by sandwiching it between two sheets of aluminum foil. What area must the sheets have if the capacitor is to have a capacitance of 0.5μF?

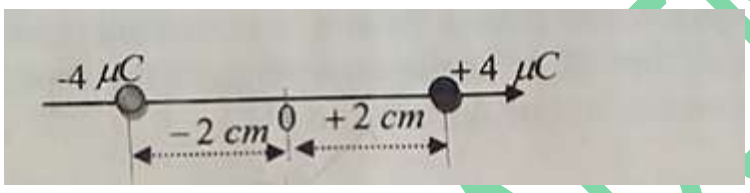
(A) 12m^2 (B) 0.6m^2 (C) 6.14m^2 (D) 0.12m^2

SOLUTION: Given: ε_r = 2.3, d = 0.25mm =2.5x10^{-4}m, C = 0.5μF

$$C = \frac{\varepsilon_0 \varepsilon_r A}{d} \Longrightarrow A = \frac{Cd}{\varepsilon_0 \varepsilon_r} = \frac{(5X10^{-7})(2.5x^{-4})}{(2.3)(8.85x10^{-12})} = 6.14m^2$$

ANSWER: C

24. Two equal and opposite charges are located along x – axis at – 2.0cm and + 2.0cm as shown in the figure below. How much would be the electric potential at the origin?



(A) 1.8MV (B) Zero (C) 3.6MV (D) 4.5MV

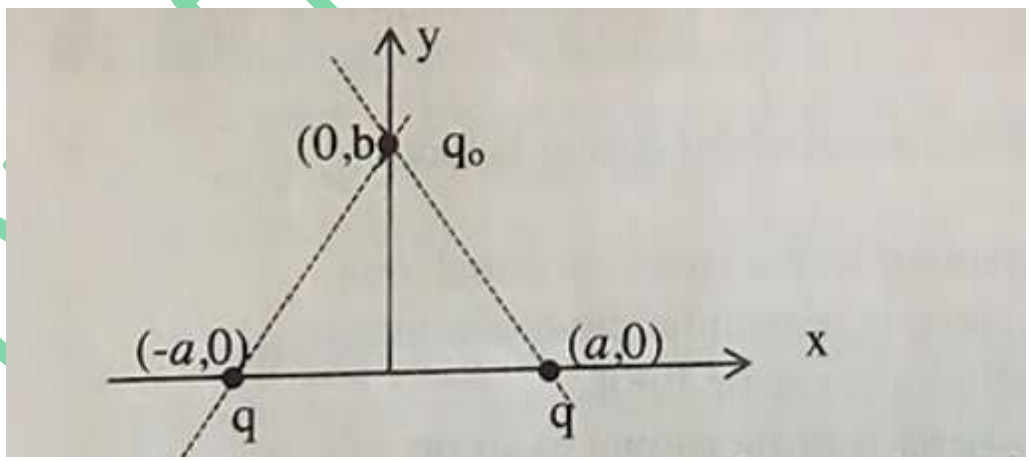
EXPLANATION:

In this question Q = 4μC and V = V_1 + V_2

$$V = \frac{KQ_1}{r_1} + \frac{KQ_2}{r_2} = \frac{(9x9^9)(-4x4^{-6})}{0.02} + \frac{(9x9^9)(4x4^{-6})}{0.02} = 0\ V$$

ANSWER: B

25. Two like charges of value q are fixed at x= a and x = -a in the diagram below.



I f a test charge q_o is released at y= b, which path will it follow?

(A) along y-axis (C) along a line y = $\frac{b}{a}$x + b

(B) along a line y = - $\frac{b}{a}$x + b (D) It stays at y = b

EXPLANATION:

- The test charge move due to the force exerted on it from both charges.
- The charge q found at (a,0) push or pull (depending on the sign of the charge) the test charge along the line y = - $\frac{b}{a}$x + b .
- The charge q found at (-a,0) push or pull (depending on the sign of the charge) the test charge along the line y = $\frac{b}{a}$x + b .

❖ Since , the net Electrostatic force on the test charge from both charges moves the test charge along y – axis

ANSWER: A

26. In Young's double slit experiment, if the slit separation is 1.2mm and the average spacing of the bright fringes observed on a screen placed 4m away from the source is 2mm. W hat is the wavelength of the light source?

(A) 550nm (B) 750nm (C) 630nm (D) 600nm

SOLUTION: given:

- slit separation (s)=1.2mm
- distance from slits to screen(D)=4m
- distance b/n successive fringes(w)=2mm
- wavelength(λ) =?

$$\frac{\lambda}{s}=\frac{\omega}{D}\Longrightarrow \lambda=\frac{\omega s}{D}=\frac{2mmx1.2mm}{4m}=0.6x10^{-6}m=600nm$$

ANSWER: D

27. The colors seen from soap bubbles and oil slicks are a manifestation of thin film interference. What is the cause of this interference?

(A) Interference from refraction of light.
(B) Interference from diffraction of light.
(C) Interference from reflection of light from the two surfaces of the film.
(D) Interference from superposition of lights that are incident and reflected.

ANSWER:

28. A 50 cm pipe is open at one end and closed at the other end. When air is blow at 150 Hz. What is the velocity of the sound along the pipe?

(A) 300m/s (B) 100m/s (C) 330m/s (D) 150m/s

SOLUTION: since its open at one end and closed at one end its velocity is given by

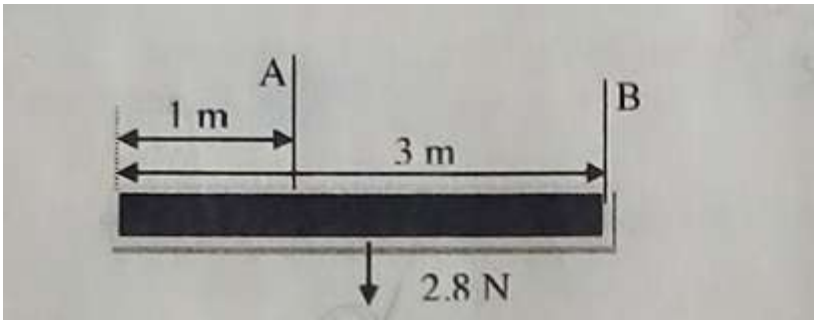
V=4Lf

V=4Lf=4x0.5mx150Hz=300m/s

ANSWER: A

29. The rod is shown in the figure below is uniform and its weight is 2.8N. The length of the rod is 3.0 m. Two ropes A and B keep the rod in the horizontal position. Rope A is 1.0m from one end and rope B is at the other end of the rope. What is the calculated value of the tension in rope A?

QUBEE ACADEMY



(A) 1.4N (B) 0.7N (C) 2.8N (D) 2.1N

SOLUTION: assume the rod is at equilibrium and the weight of the road is at the middle since, its weight is uniformly distributed.

By using second condition of equilibrium, find moment about point B.

$\sum \tau_B = 0$

$(T_A)(2) = (2.8)(1.5) \implies T_A = 2.1N$

ANSWER: D

30. Which of the following statement is correct about elastic behavior of materials?

(A) In tensile stress the force is parallel to the cross-sectional area, where as in shear stress, the force is perpendicular to the area.

(B) All materials do not necessarily have elastic limit.

(C) F or sufficiently small stress, stress is proportional to stain.

(D) With plastic materials, the body goes to original dimensions after removal of the force that caused deformation.

EXPLANATION:

- From Hooke's law $F \backsim X$
- All materials necessarily have elastic limit.
- With plastic materials, irreversible changes occurred while the body was being deformed.

ANSWER: C

31. A fluid of unknown density filled in a beaker of $250.0cm^3$. The pressure due to the fluid at the base of the beaker is 2.30 Pa. The base area of the beaker is $102cm^2$. What is the density of the fluid?

(A) 9.2×10^1 Kg/m^3 (C) 9.2×10^6 Kg/m^3

(B) 7.9×10^3 Kg/m^3 (D) 9.2×10^3 Kg/m^3

EXPLANATION: $P = \rho gh = \rho g\frac{V}{A}$

$\implies \rho = \frac{PA}{gV} = \frac{(2.3)(102X10^{-4})}{(10)(250X10^{-6})} = 9.2Kg/m^3$

ANSWER: NO ANSWER

32. Which of the following statement is correct?

(A) Surface tension is proportional to the length along with the surface tension force acts

QUBEE ACADEMY

(B) Surface tension pulls the liquid column up until there is sufficient mass of liquid for weight to overcome the intermolecular force.

(C) The angle between the wall of a container and the liquid surface has no role on the capillary action.

(D) In a given tube, the capillary action is large for a liquid of larger density.

EXPLANATION:

- Surface tension $f = \frac{F}{l}$
  - Surface tension(f) is inversely proportional with length (l)
- Capillary action $h = \frac{2f\cos\theta}{\rho g r}$
  - Capillary action is **smaller** for liquid of **larger** density.
- Surface tension pulls the liquid column up until there is sufficient mass of

ANSWER: B

33. Water flows at a rate of 0.4 litter per second through garden hose of inside diameter 4.0cm. The nozzle of the hose is a circular opening of diameter 2.cm. What is the speed of the water when, it emerges? (π **= 3.14)**

(A) 0.32m/s (B) 12.7m/s (C) 3.2m/s (D) 1.27m/s

SOLUTION: from continuity equation $A_1V_1 = A_2V_2$ = discharge

Where, A_1V_1 is Volume flow rate at the inlet

$A_1V_1 = 0.4\ L/s = 0.4 \times 10^{-3}\ m^3/s$,

And A_2V_2 is Volume flow rate at the outlet (emerge)

A_2, Area of the outlet $A_2 = \pi r_2^2 = 3.14x(\frac{0.02}{2})^2 = 3.14x0.0001 = 3.14X10^{-4}m^2$

Know $\Longrightarrow A_1V_1 = A_2V_2$

$\Longrightarrow 0.4 \times 10^{-3}\ m^3/s = (3.14X10^{-4}m^2)(V_2)$

$\Longrightarrow V_2 = 1.27m/s$

ANSWER: D

34. How much heat would be absorbed by 2g of ice at 0^0c dropped into water at 0^0c, to melt it totally to water at 0^0c? (Latent heat of melting, L=340,000J/Kg)

(A) 340J (B) 840J (C) 680J (D) 420J

SOLUTION: Given m = 2g =$2x10^{-3}$Kg , L= 340,000J/Kg

$E_H = mL_f$

= $(2x10^{-3}Kg)x(340,000J/Kg)$

= 680J

ANSWER: C

35. The direction of heat flow is from:

(A) high pressure to low pressure

(B) a point of higher emissivity to lower one

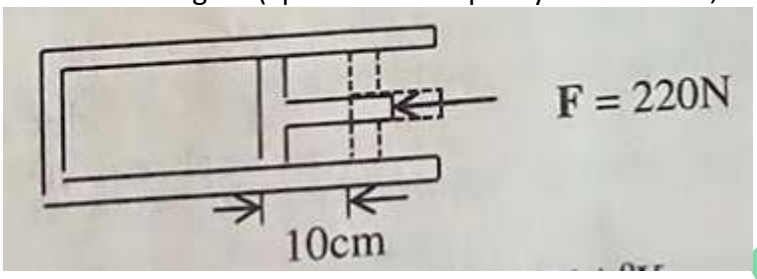
(C) high density to low density

(D) high temperature to low temperature

ANSWER: D

QUBEE ACADEMY

36. External force of 220N applied on a piston of a cylinder containing 1.25g of ammonia gas move 10cm as shown in the diagram below. Assuming adiabatic process, what is the rise in temperature of the gas? (Specific heat capacity of ammonia, c=2200J/Kg ^{0}K)



(A) 4^0K (B) 0.004^0K (C) 8^0K 0.008^0K

SOLUTION: since the process is adiabatic $\Delta Q = 0$

Then, $\Delta U = \Delta W = F\Delta x$

$\Longrightarrow \Delta U = F\Delta x$ but $\Delta U = mc\Delta T$

$\Longrightarrow mc\Delta T = F\Delta x$

$\Longrightarrow \Delta T = \frac{F\Delta x}{mc} = \frac{(220)(0.1)}{(1.25x10^{-3})(2200)} = 8^0$K

ANSWER: C

37. Which of the following statement is correct?
(Here ρ is density of an ideal gas, m is the mass of the gas and c is speed of particles)

(A) P (Pressure of an ideal gas) = $\frac{1}{2}\rho\langle c^2\rangle$

(B) For a mixture of two different gases with equal partial pressure and equal number of molecules in a container , $\frac{m_2}{m_1} = \frac{\langle c_1^2\rangle}{\langle c_2^2\rangle}$

(C) For a mixture of two gases in equilibrium in a container , $\frac{\rho_2}{\rho_1} = \sqrt{\frac{\langle c_1^2\rangle}{\langle c_2^2\rangle}}$

(D) For a mixture of two gases in equilibrium in a container , $\frac{\rho_1}{\rho_2} = \sqrt{\frac{\langle c_2^2\rangle}{\langle c_1^2\rangle}}$

EXPLANATION:

- P (Pressure of an ideal gas) = $\frac{1}{3}\rho\langle c^2\rangle$
- For a mixture of two different gases with equal partial pressure and equal number of molecules in a container , $\frac{m_2}{m_1} = \frac{\langle c_1^2\rangle}{\langle c_2^2\rangle}$

ANSWER: B

38. Traveling wave is given by the equation Y = Acos(kx – ωt) ,where k is the wave number and ω is the angular frequency. What is the distance that the wave travels in the time t= T/2?

(A) half the wavelength
(B) full wavelength
(C) a quarter of the wavelength

QUBEE ACADEMY

(D) at the origin

SOLUTION: Y = Acos(kx – ωt)

At t = T/2 , Y = A $\Rightarrow A = A\cos(2\pi\frac{x}{\lambda} - \left(\frac{2\pi}{T}\right)(\frac{T}{2}))$

$\Rightarrow 1 = \cos(2\pi\frac{x}{\lambda} - \pi)$

$\Rightarrow 2\pi\frac{x}{\lambda} - \pi = \cos^{-1}(1)$

$\Rightarrow x = \frac{\lambda}{2}$

ANSWER: A

39. Which of the following is not an example of simple harmonic motion?

(A) A mass attached to a spring system oscillating in horizontal direction to the surface of the Earth.

(B) Rotation of second pointer in hand watch

(C) Oscillation of simple pendulum

(D)) A mass attached to a spring system oscillating in vertical direction to the surface of the Earth.

EXPLANATION: Rotation of second pointer in hand watch is not an example example of simple harmonic motion

ANSWER: B

40. Which of the following statement is **NOT** correct?

(A) No process is possible in which there is an overall decrease in the entropy of the universe.

(B) The spontaneous transfer of energy from cooler body to a hotter body is not possible.

(C) The complete conversion of energy from a hot source into work is not possible

(D) Spreading out of random kinetic energy through heating does not represent an overall increase in entropy.

EXPLANATION: Spreading out of random kinetic energy through heating represent an overall increase in entropy.

ANSWER: D

41. Complete the following equation which represents a nuclear fission. What is the particle represented by **X**?

$$^{235}U + {}^{1}_{0}n \longrightarrow {}^{95}Rb + {}^{139}Cs + 2X + \text{energy?}$$

(A) electron (B) neutron (C) proton (D)alpha particle

EXPLANATION: The equation is balanced only when X is a neutron.

ANSWER: B

42. When ultraviolet light is shone on a clean metal surface the surface will emit electrons. What is the necessary preconditions for electrons to be ejected from the metal surface?

QUBEE ACADEMY

(A) The intensity of light must be high enough
(B) The frequency of the metal has to be less than that of ultraviolet light
(C) The wavelength of the light has to be greater than that of ultraviolet light.
(D) The minimum energy required to release the electron is the same as the work function of the metal.

EXPLANATION: The minimum energy required to release the electron is the same as the work function of the metal

ANSWER: D

43. A series circuit consisting of 50Ω resistor and capacitor of capacitive reactance 50Ω are connected to alternating source of voltage (rms) 100V. What is the average power output and power factor of the circuit?

(A) 141.8W, 0.8
(B) 200W, 0.8
(C) 100W, 0.707
(D) 70.7W, 0.707

EXPLANATION: R =50Ω, Xc = 50Ω, Vrms = 100V,

Pav = (Vrms)(Irms)cosΘ

$\Longrightarrow$Irms = $\frac{Vrms}{Z}$, Z = $\sqrt{R^2 + (X_L^2 - X_C^2)}$ = $\sqrt{50^2 + 50^2}$ = $50\sqrt{2}$

$\Longrightarrow$Irms = $\frac{100}{50\sqrt{2}} = \frac{2}{\sqrt{2}}$ A

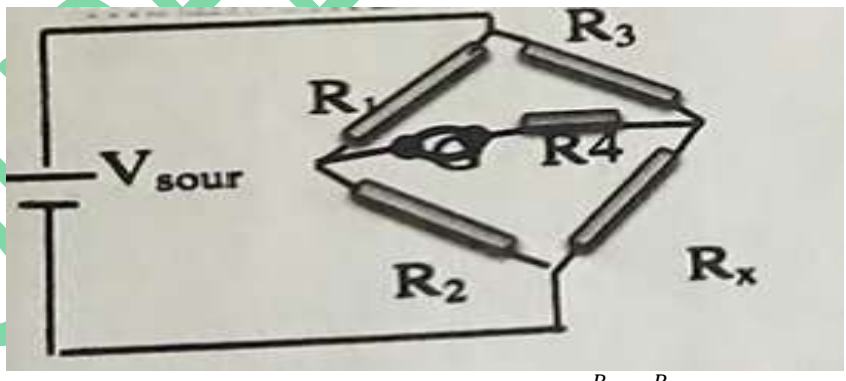
$\Longrightarrow\Theta = \tan^{-1}(\frac{X_L - X_C}{R}) = \tan^{-1}(\frac{50}{50}) = \tan^{-1}(1) = 45^0$

Pav = (Vrms)(Irms)cosΘ = (100)($\frac{2}{\sqrt{2}}$)(cos45^0) = 100W

Power factor = cosΘ = cos45^0 = 0.707

ANSWER: C

44. You are given the bridge circuit as shown in the diagram below. The resistance R is used to limit the current in the galvanometer. Which of the following is correct in measuring Rx?



(A) The bridge balance condition is given by $\frac{R_X}{R_3} = \frac{R_2}{R_1}$
(B) The bridge balanced when $\frac{R_1}{R_2} = \frac{R_3}{R_4}$
(C) $\frac{R_X}{R_3} = \frac{R_1}{R_4}$
(D) $\frac{R_X}{R_3} = \frac{R_2}{R_4}$

QUBEE ACADEMY

EXPLANATION: : the bridge is balanced if and only if : $\frac{R_X}{R_3} = \frac{R_2}{R_1}$

ANSWER: A

45. A rectangular loop of area 0.4m^2 is placed in a magnetic field that is changing at a rate of 100T/s. If the normal of the loop makes angle 60^0 with field, what is the magnitude of induced emf?

(A) 80V (B) 40V (C) 34,64V (D) 20V

SOLUTION: Given: A= 0.4m^2 , Θ=60^0 , $\frac{\Delta B}{\Delta t} = 100$T/s

$$\varepsilon = \frac{A\Delta B\cos\Theta}{\Delta t} = 0.4\text{x}100\text{x}\cos 60^0 = 20\text{V}$$

ANSWER: D

46. Two long wires of 10m in the length carries a current of 2.0A and 0.5A in the same direction. The wires are separated by 4.0cm. What is the magnetic force that the wires exerted on each other?

(A) 5X10^{-6}N (C) 5X10^{-7}N

(B) 5X10^{-5}N (D) 4X10^{-6}N

SOLUTION: Given I_1 =2A, I_2 =0.5A , r = 4cm =0.04m, ℓ=10m , $\mu_0 = 4\pi x10^{-7}$H/m

$$F = \frac{\mu_0 I_1 I_2 \ell}{2\pi r} = \frac{4\pi x10^{-7} x2x0.5x10}{2\pi x0.04} = 500\text{x}10^{-7}\text{N} = 5\text{x}10^{-5}\text{N}$$

ANSWER: B

47. Lenz's law in electromagnetic induction follows from which law of conservation?

(A) charge (B) momentum (C) energy (D) mass

EXPLANATION: Lenz's law in electromagnetic induction follows the law of conservation Of **energy.**

ANSWER: C

48. What is the expression of the centripetal acceleration of a particle of charge q and mass m moving in uniform in a uniform magnetic field **B** on a circle of radius r if **B** is perpendicular to the particle's direction of motion?

(A) $\frac{q^2B^2}{m^2}r$ (B) $\frac{2qB}{mr}$ (C) $\frac{q^2B^2}{m}r$ (D) $\frac{qB}{m}$

EXPLANATION: you know that $F_C = \frac{mv^2}{r}$ and F_B = qvB

Equate them $F_C = F_B$

$$\Rightarrow \frac{mv^2}{r} = \text{qvB}$$

$$\Rightarrow \text{v} = \frac{qB}{m}r$$

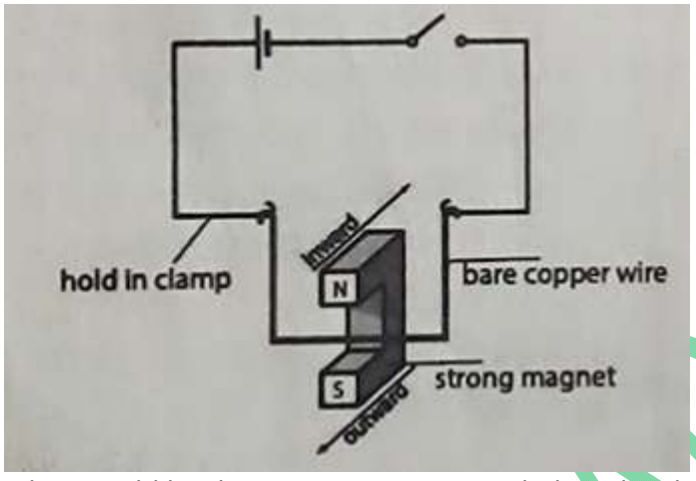
Also you know that $a_c = \frac{v^2}{r}$

$$\Rightarrow a_c = \frac{v^2}{r} = \frac{(\frac{qB}{m}r)^2}{r} = \frac{q^2B^2}{m^2}r$$

ANSWER: A

QUBEE ACADEMY

49. A current of 5A flows through the circuit when the switch in the figure below is closed.



What would be the copper wire suspended on the clamp?

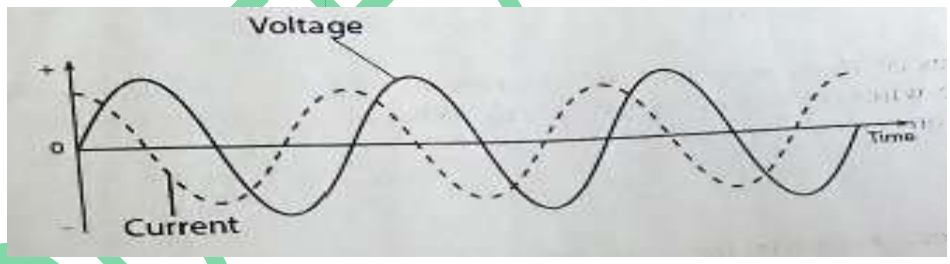
(A) experience no force (C) be lifted upward

(B) be deflected outward (D) be deflected inward

EXPLANATION: by using right hand rule the wire deflected inward.

ANSWER: D

50. The applied ac voltage and the resulting current, in a circuit element, is shown below



What is the circuit element?

(A) Inductor (B) Resistor (C) Capacitor (D) Diode

EXPLANATION: In this case current leads the voltage, thus its capacitive circuit element.

ANSWER: C

QUBEE ACADEMY

QUBEE EXAM BOOK

EUEE

ANSWER KEY(PDF)

EUEE PHYSICS 2012(13)/2021

ANSWER WITH EXPLANATION(PDF)

JOIN US ON telegram channel @qubeeacademy

IF YOU WANT

MATHS,APTITUDE,CHEMISTRY EUEE ANSWER(PDF) AND MATHS,CHEMISTRY,PHYSICS MODEL (addisababa) EXAM ANSWER(PDF)

JOIN OUR TELEGRAM

CHANNEL"@qubeeacademy"

"Do all the good you can,
By all the means you can,
In all the ways you can,
In all the places you can,
At all the times you can,
To all the people you can,
As long as ever you can."

1. Equilibrium is the state of an object when
   A. The net force and net torque are both zero.
   B. The object has constant angular acceleration.
   C. The net forceZ acting on it is constant.
   D. The object has constant linear acceleration.

Explanation: Equilibrium is the state of an object when the net force and net torque Are both zero.

Answer: A

2. The fulcrum of a uniform 20 Kg seesaw that is 4.0 m long is located 2.5 m from one end. A 30Kg child sits on the long end. The weight of a person sitting at the other end in order To balance the seesaw is _____ .
   A. 433 N
   B. 567 N
   C. 750 N
   D. 850 N

Solution:

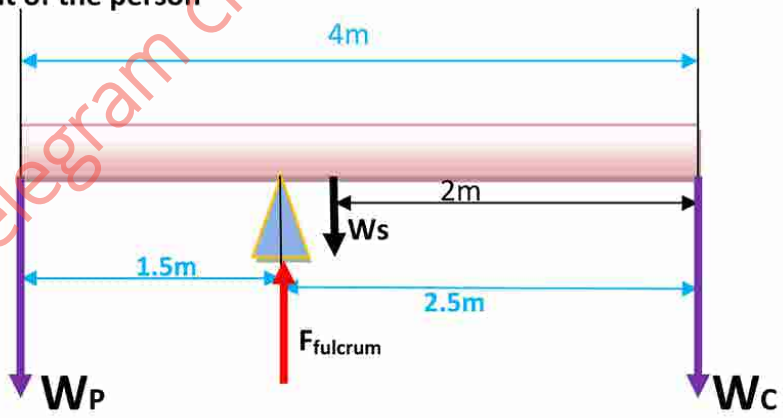
Since the seesaw is uniform the mass is assumed to be concentrated at the center of the seesaw. Where,

Wc = weight of the child = 30kg x 10m/s2 = 300N

$F_{fulcrum}$ = force on the seesaw from the fulcrum

Ws = weight of the seesaw = 20kg x 10m/s2 =200N

Wp = weight of the person



❖ Now apply equilibrium of torques about the fulcrum point.

Since the seesaw is in balanced (equilibrium) condition net torque at the fulcrum point is zero.

$$\Rightarrow \sum \tau_F = 0$$
$$\Rightarrow W_c x 2.5m - W_s x (2.5-2)m - W_P x 1.5m = 0$$
$$\Rightarrow -300NX2.5m - 200Nx0.5m + 1.5W_P m = 0$$
$$\Rightarrow 1.5W_P m = 750 + 100\ N = 650$$
$$\Rightarrow W_P = 567N$$

Answer: B

JOIN US ON telegram channel @qubeeacademy

3. A material rod that is 4.00 m long and 0.5cm^2 in cross-sectional area is found to stretch 0.20cm under a tension of 5000N. The Young's Modulus for this material is _____ .
   A. 2.0 X 10^{11} N/m^2
   B. 5.0 x 10^8 N/m^2
   C. 1.0 x 10^4 N/m^2
   D. 1.0 x 10^8 N/m^2

Solution: Young's modulus(E) is defined as: the ratio of tensile stress to tensile strain up to the material's limit of proportionality.

In symbols: $E = \frac{F/A}{x/L}$

Rearranging, this gives $E = \frac{FL}{xA}$

Given L = 4.00m, x =0.20cm = 0.002m, A = 0.5cm^2 = 5 x 10-5 m^2, F = 5000N

$$E = \frac{FL}{xA} = \frac{5000x4}{0.002x5x10^{-5}} = 2 \times 10^{11} \text{ N/m}^2$$

Answer: A

4. Which one of the following is **NOT** true about Pascal's principle and its application?
   A. In pneumatic application, air is used for pressure transmission instead of liquid.
   B. The hydraulic lift is a speed multiplying device in which a large force lifts a light object over a long distance.
   C. It has applications in hydraulic brakes for vehicles, where confined oil connects a small piston (brake pedal) to a large piston connected to the brake drums on the wheel of the car.
   D. It has applications in hydraulic lift in which a small force is applied to a smaller piston is used to lift heavy object on large.

Answer: B

5. Which one of the following is **NOT** correct about factors that affecting the streamlining of objects moving in fluid?
   A. The mass of the object
   B. Shape and surface area of the object moving in fluid
   C. Compressibility of the fluid
   D. Density of the fluid

Explanation: There are four properties of fluid (such as air) that affects streamlining of objects moving in fluid:

- compressibility (how much its volume can be reduced)
- Density
- temperature and
- viscosity

➢ That means streamlining flow is not affected by the shape and surface area of the object.

Answer: B

JOIN US ON telegram channel @qubeeacademy

6. Which of the following is correct?
   A. Internal energy of a system is independent of its mass or the number of molecules in the system.
   B. Temperature is a measure of the average molecular kinetic energy of a gas.
   C. The temperature is a measure of the amount of energy that flows from hot to colder region.
   D. Heat is energy that can be transferred from one object to another at equal temperature.

Answer:B

7. Two moles of an ideal gas at a temperature of 308 K is confined in a volume of 5.00×10^{-3} m^3. The pressure of the gas is (Universal gas constant R= 8.314 J/mol.K).
   A. 1.23×10^6 Pa
   B. 5.12×10^6 Pa
   C. 1.02×10^6 Pa
   D. 1.00×10^6 Pa

Solution: given: number of moles(n)= 2mol, temperature(T) = 308K, V = 5.00×10^{-3} m^3
R = 8.314 J/mol. K

- For ideal gas: PV = nRT
  Then $P = \frac{nRT}{V} = \frac{2x8.314x308}{5x10^{-3}} = 1.24x10^6 Pa$

Answer: A

8. A glass contains 12 mole of water molecule (H_2O). The number of water molecules, the mass of water, and the mass of each water molecules in the glass are, respectively (Molar mass of H is 1.0g and O is 16.0 g).
   A. 96.32×10^{23} molecules, 0.036 Kg, 0.009×10^{-26} Kg.
   B. 102 x 1023 molecules, 0.024Kg, 6.02×10^{-26} Kg.
   C. 90.32×10^{23} molecules, o.192 Kg, 18×10^{-26} Kg.
   D. 72.24×10^{23} molecules, o.216 Kg, $35.9 \times x10^{-26}$ Kg.

Solution: Given number of mole(n) = 12mol, mass of H = 1.0g and mass of O = 16.0g, N_A = Avogadro's number, 6.02×10^{23} mol^{-1}. Then:

- The number of water molecules = nN_A = 12mol x 6.02×10^{23} mol^{-1} =72.24×10^{23} molecules
- the mass of water = m = nM = 12mol x (2x1 + 16)g/mol = 216g = 0.216Kg
- the mass of each water molecules in the glass = $\frac{M}{N_A} = \frac{18}{6.02x10^{23}}$ =2.99×10^{-6} Kg

Answer: D

9. Which one of the following statements is correct about thermodynamic processes?
   A. An isochoric process occurs at constant pressure and its p-v diagram is horizontal.
   B. In an adiabatic process, there is no heat removed from or absorbed by the system and its p-v diagram is a decreasing plot.
   C. An isobaric process occurs at constant volume and its p-v diagram is a vertical line.

JOIN US ON telegram channel @qubeeacademy

D. An isothermal process occurs at constant pressure and its p-v diagram is a linearly increasing plot.

Explanation:

- An isobaric process occurs at constant pressure and its p-v diagram is horizontal.
- An isochoric process occurs at constant volume and its p-v diagram is a vertical line.
- In an adiabatic process, there is no heat removed from or absorbed by the system and its p-v diagram is a decreasing plot.
- An isothermal process occurs at constant temperature and its p-v diagram is a decreasing plot.

Answer: C

10. In a thermodynamic process, 1.5×10^5 J of heat is added to an ideal gas to keep the pressure constant at 2.0×10^5 Pa while the volume increase from $6.3m^3$ to $7.1\ m^3$. The change in the internal energy of the gas is

A. -1.0×10^4 J.
B. 14.1×10^4 J.
C. 3.1×10^4 J.
D. 1.0×10^4 J.

Solution: given: $\Delta Q = 1.5 \times 10^5$ J

$P = 2.0 \times 10^5$ Pa, $\Delta V = 7.1 - 6.3 = 0.8m^3$

- since the pressure is keep constant the process is isobaric, thus first law of thermodynamics become: $\Delta U = \Delta Q - P\Delta V$ (hence, its expanding)

$$\Delta U = 1.5 \times 10^5 - (2.0 \times 10^5) \times (0.8m^3) = -1.0 \times 10^4 \text{ J}$$

Answer: A

11. Which one of the following is correct about diffraction of light?

A. As the width of a single slit decrease, the width of he central bright fringe decreases too.
B. As the number of slits of a grating increase, the bright fringes become brighter, taller and narrower.
C. Diffractions of light passing through a circular aperture results in parallel bright and dark fringes.
D. Diffraction of light passing through a single slit produces bright and dark fringes of equal widths.

12. In Millikan's oil drop experiment,

A. The electric field between the anode and cathode can be increased by decreasing the distance and the potential difference between them.
B. The charge of the droplet was found to be half-integer multiple of electron charge.
C. The mass of the droplet was determined by measuring its terminal velocity in the absence of electric field.
D. Tiny droplets of negatively charged mineral oil where balanced under the action of downward electric force and weight.

JOIN US ON telegram channel @qubeeacademy

Answer: C

13. Many chemical reactions release energy. Suppose that at the beginning of a reaction , an electron and a proton are separated by 0.110 nm, and their final separation is 0.100 nm. The change in the electric potential energy in this reaction(in eV) is

A. 1.30 eV.
C. 14.34 eV.
B. 13.1 eV.
D. 27.5 eV.

Solution: For an electron in the presence of an electric field produced by a proton, the electric potential energy is defined as:

$$U = \frac{Kq_eq_p}{r}$$

Where q_e is the electron charge, q_p is the proton charge, r is the separation distance between the charges and k is the coulomb constant.

$$\Delta U = U_f - U_i$$

$$\Delta U = \frac{Kq_eq_p}{r_f} - \frac{Kq_eq_p}{r_i} = Kq_eq_p\left(\frac{1}{r_f} - \frac{1}{r_i}\right)$$

$$\Delta U = (9x10^9)x(1.60x10^{-19})x(1.6x10^{-19})x(\frac{1}{0.1x10^{-9}} - \frac{1}{0.11x10^{-9}})$$

$$\Delta U = 2.09x10^{-19}J$$

$$\Delta U = 2.09x10^{-19}x6.25x10^{18}eV = 1.30eV$$

Answer: A

14. When an insulator is placed in an external uniform electric field,

A. The induced electric field within the insulator is perpendicular to the external field.
B. The net electric field within the insulator is greater than the external electric field.
C. The electric field induced within the insulator is greater than the external electric field, but has the same direction as the external field.
D. Electric dipoles are induced within the insulator and produce induced electric field opposite to the external field.

Explanation: Electric dipoles are induced within the insulator and produce induced electric field opposite to the external field.

Answer:D

15. Consider a parallel plate capacitor with plate area **A**, plate separation **d**, charge **Q**, capacitance **C**, potential difference **V** and electric field **E** between the plates. The electrical energy density stored by the capacitor

A. Is directly proportional to the square of the electric field **E** between the plates.
B. Is directly proportional to the electric field **E** between the plates.
C. Increases as the capacitance **C** and potential difference **V** increase.
D. Depends on the plate area **A** and plate separation **d**.

Explanation: electrical energy density stored by the capacitor is given by:

$$\boldsymbol{U = {}^{1}/_{2}\,\varepsilon_o\varepsilon_r E^2},$$ where **U** is electric energy density stored.

JOIN US ON telegram channel @qubeeacademy

- For any given parallel plate capacitor the electrical energy density, **(U)** is directly proportional to the dielectric constant, $(\varepsilon_0\varepsilon_r)$ and the square of the electric field strength, **(E)** between the plates.

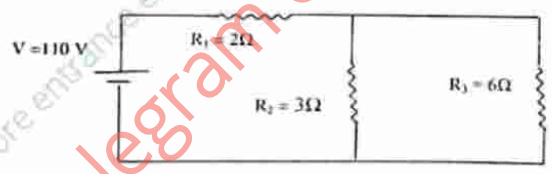
Answer: A

16. A potential difference **V** is applied across the ends of a uniform conducting wire of length **l**, cross-sectional area **A**, and containing **n** free charge carriers per unit volume. Which one of the following is true?
    A. The current density in the conductor is directed in the in the direction drift velocity of the free charge carriers.
    B. The electric current in the conductor flows perpendicularly to the drift velocity of free charges.
    C. The electric current in the conductor flows arbitrarily in all directions.
    D. The free electrons in the conductor flow in the direction of the electric field in the conductor.

Explanation: The current density in the conductor is directed in the in the direction drift velocity of the free charge carriers.

Answer:A

17. Three resistors are connected across a battery as shown below. The potential difference across the resistors R1, R2, and R3 are, respectively,



A. 110V, 25V, 30V
B. 55V, 55V, 55V
C. 55V, 82.5V, 165V
D. 50V, 30V, 30V

Explanation: the voltage drop across the resistor 6Ω and 3Ω are equal since, they are Parallel. And, the circuit is reduced to the below circuit by finding the equivalent resistor of the parallel resistor.

$R_{eq1} = \frac{6x3}{6+3} = 2\ \Omega$

Now, by using voltage divider rule:

Since both resistors are equal the voltage drop is also equal.

Thus the voltage drop across all resistor is equal and its 55V.

Answer: B

18. According to Kirchhoff's junction rule,
    A. The amount of electric charge entering a junction is equal to the amount leaving the junction.
    B. Charges can disappear or appear at the junction.

JOIN US ON telegram channel @qubeeacademy

C. The amount of electric charge flowing into a junction is less than the amount flowing out of the junction.
D. The amount of electric charge flowing into a junction is greater than the amount flowing out of the junction.

Explanation: Kirchhoff's junction rule states that " The amount of electric charge entering a junction is equal to the amount leaving the junction".

Answer: A

19. Which of the following is true about galvanometer?
A. A galvanometer can be converted to an ammeter that can read large currents by connecting a small resistance in parallel with it, and can be converted to a voltmeter by connecting a large resistance in series with the galvanometer
B. To use a galvanometer as an ammeter that can read voltages, we connect a small resistance in series with the galvanometer
C. Galvanometer can be converted to a voltmeter by connecting a small resistance in parallel with the galvanometer
D. To use a galvanometer as an ammeter that can measure large currents, we need to measure its resistance by connecting a large resistance in series with the galvanometer.

Explanation:

- A galvanometer can converted to a voltmeter by adding a large resistance in series with the galvanometer.
- A galvanometer can converted to an ammeter by adding a low resistance in parallel with the galvanometer.

Answer: A

20. A galvanometer has an internal resistance of 100 Ω and deflects full scale for 1 mA. The shunt resistance required to use it as an ammeter to read currents up to 1.0A, and the resistance required to use it as a voltmeter to give a full scale deflection of 100V are, respectively.
A. 0.1 Ω and 100 Ω
B. 1.00 Ω and 10 Ω
C. 1mΩ and 9.9×10^4 Ω
D. 10 mΩ and 10^4 Ω

Solution: first the shunt resistance required is determined as:

- Under these circumstances we want the pointer of the meter just to reach the end of its scale, and this will mean 1 mA (0.001 A) flowing through it.
  Then by using Kirchoff's law the current flows the shunt resistance is Ish = 1A - 0.001A = 0.999 A then, the potential difference across the shunt resistance is equal to the p.d across the coil(internal resistance) since they are parallel. Vsh = 0.001x100 = 0.1V.
  Now, the shunt resistance is Rsh = $\frac{Vsh}{Ish} = \frac{0.1}{0.999} = 0.1\ \Omega$
- Second the series resistance is determined as:
  Under these circumstances we want the pointer of the meter just to reach the end of its scale, and this will mean 1mA the (0.001 A) flowing

JOIN US ON telegram channel @qubeeacademy

through it and the coil. Then by using Kirchoff's law the voltage drop across the series resistance is Vs = 100 – 0.001x100 = 99.9V

Then the series resistance Rs = $\frac{Vs}{Is} = \frac{99.9V}{0.001}$ = 9.99 x 10^4 Ω

Answer: NO ANSWER

21. According to the kinetic theory of gases, the
    A. Diffusion rate of a gas is inversely proportional to the square root of the molar mass because it is directly proportional to the molecular speed.
    B. Particles of an ideal gas undergo inelastic collision between themselves and with the walls of the container.
    C. Average translational kinetic energy of the particles of an ideal gas increases as gas gets cooled.
    D. Internal energy of an ideal gas is equal to the potential energy due to interaction between the particles of the gas.

Explanation: according to kinetic theory of gases:

- Collisions between particles and between particles and walls are perfectly **elastic** (there is no loss of kinetic energy during any collision).
- The internal energy of the gas is made up of random kinetic energies of particles only. There is **no potential energy** component.
- Average translational kinetic energy of the particles of an ideal gas decreases as gas gets cooled.
- Diffusion rate of a gas is inversely proportional to the square root of the molar mass because it is directly proportional to the molecular speed

Answer: A

22. At t=0, an object undergoing SHM has maximum displacement of 0.650 m and angular frequency of 7.40 rad/s. Which of the following is correct about the motion of the oscillator?
    A. The frequency of the oscillator is 7.40 Hz and its period is 0.135 s.
    B. The position of the object is x = 0.65cos(7.40t) and its acceleration is a = -35.59 cos(7.40t).
    C. The position of the object is x = 0.650cos(7.40t) and acceleration is a = - 3.59sin(7.40t).
    D. The position of the object is x = 0.650 sin(7.40t) and its velocity is V = 4.81cos(7.40t).

Explanation: Given $\omega = 7.40 rad/s$, maximum displacement(amplitude) = 0.650m

Note: at t = 0 , A = maximum displacement = 0.650 m thus X(position) must be in cosine form X= Acos(ωt)

Now,

- Frequency of oscillator, f = $\frac{\omega}{2\pi} = \frac{7.4}{2x3.14}$ =1.177 Hz
- Period(T) = $\frac{1}{f} = \frac{1}{1.177}$ =0.847s
- X= Acos(ωt) = 0.65cos(7.40t).

JOIN US ON telegram channel @qubeeacademy

- V = -Aω $\sin(\omega t) = -4.81(7.40t)$.
- a = Aω^2 $\cos(\omega t) = -35.594(7.40t)$.

Answer: B

23. A 0.35 Kg mass attached to the end of a spring oscillates 2.5 times per second with amplitude of 0.15 m. which of the following is true about the motion of the mass?
    A. The acceleration when it is 0.10 m from equilibrium is 25.00 m/s^2.
    B. The velocity when its 0.10m from equilibrium is 3.0m/s.
    C. The total energy of the system is 97.0 J.
    D. The velocity when it passes the equilibrium is 2.355m/s.

Explanation: Given f = 2.5Hz, m= 0.35kg and A =0.15m

Now,

- At the equilibrium position the velocity is given by $V_0 = 2\pi Af$ = 2.355m/s
- Total energy of the system is given by: Total energy = $^1/_2$ mV_0^2 = $^1/_2$mω^{2}A^2

Total energy = 0.97 J

Answer: D

24. Identify a true statement about a mechanical wave
    A. The speed of a wave traveling along a string increases as the tension in the string increases and as the linear density of the string decreases.
    B. The speed of a wave traveling across a thin string is equal to its speed when traveling across a thick string of the length and tension.
    C. The velocity of traveling wave is equal to the velocity of the particles through which the wave propagates.
    D. As a wave travels from one point too another along a medium, it transmits energy and particles of the medium from point to point.

Explanation: For a mechanical wave travelling along a string the speed of the wave depends on the tension of the string and the mass per unit length (sometimes called linear density).

- v = $\sqrt{\frac{T}{\mu}}$, where
  - ✓ μ = mass per unit length (sometimes called linear density) given by μ = $\frac{m}{l}$ in kg/m
  - ✓ T = tension in the string in N.

❖ The speed of a wave traveling along a string increases as the tension in the string increases and as the linear density of the string decreases.

Answer: A

25. Which one of the following is correct statements about the intensity of sound?
    A. It is inversely proportional to the square of the distance between from the source of sound.
    B. It is directly proportional to the square of the distance between from the source of sound

JOIN US ON telegram channel @qubeeacademy

C. It is energy transmitted per unit time.
D. It is the product of the a sound and area through which the sound is transmitted.

Explanation: **intensity is** *the energy received by each square meter of a surface per Second.*

- the intensity of sound from source can be calculated assuming the sound spreads out equally in all directions. may the intensity from a point source is given by:
  - $I = \frac{P}{A}$

  where P = power of the source in W
  A = area through which the sound is transmitted.
- If we assume the sound travels out equally in all directions then the area covered is equal to the surface area of a sphere. So the equation becomes:
  - $I = \frac{P}{A} = \frac{P}{4\pi r^2}$

  where r is the distance from the source in m.

➢ Therefore, intensity of sound is inversely proportional to the square of the distance between from the source of sound.

Answer: A

26. Which of the following is correct about Doppler effect?

A. Doppler effect is the change in the frequency of a wave due to relative motion between the wave source and an observer.
B. When a sound source moves away from stationary observer, the frequency detected by the observer increases, where as the wavelength decreases.
C. When a source of sound wave moves toward stationary observer, the wavelength of the wave increases while its frequency decreases.
D. It is the change in the velocity of a wave due to relative motion between the source of the wave and an observer.

Explanation: **Doppler effect is** a change in the observed frequency of a wave occurring when the source and observer are in motion relative to each other, with the frequency increasing when the source and observer approach each other and decreasing when they move apart

Answer: A

27. Huygens's principle states that

A. The secondary wavelets are parallel to the original wave front.
B. All points along a wave front behave as a source of spherical secondary wavelets that have the same frequency and speed as the original wave front.
C. The secondary wavelets combine to produce a new wave front which has a shape different from the original wave front.
D. All points along a wave front acts as a source of plane secondary wavelets that travel at speeds and frequencies greater than that of the original wave.

JOIN US ON telegram channel @qubeeacademy

Explanation: Huygens's principle provides a description of how waves propagate through a medium. It states that all points along a wave front produce a series of secondary wavelets. These wavelets travel at the same speed and have the same frequency as the original wave.
The wavelets combine to form a new wave front and this process continues.
If the original wave front was spherical then the new wave front will also be spherical.

Answer: B

28. Which one of the following is correct about the law of reflection and the law of refraction?
    A. The ratio of the sine incident angle to the sine of the refracted angle is equal to the ratio of the speed of incident wave to the speed of the refracted wave.
    B. If the speed of the incident wave is less than the speed of the refracted wave, the refracted wave bends towards the normal line.
    C. The speed and wave length of a reflected wave are different from that of an incident wave.
    D. The incident and refracted rays make equal angles with the boundary of the two interface.

Explanation: The ratio of the sine incident angle to the sine of the refracted angle is equal to the ratio of the speed of incident wave to the speed of the refracted wave

Answer: B

29. Choose the correct statement about interference pattern due to diffraction of light through single and double slits.
    A. The light intensity of interference pattern due to double and single slits remain the same as the distance from the central bright fringe increases.
    B. The central bright fringes in both double and single slits interference are twice as wide as the first order bright fringes.
    C. Constructive interference due to double slit and single slit interference occur when the path difference between interfering waves is half-integer multiple of the wavelength.
    D. The bright and dark fringes formed when light passes through double slit have equal widths, where as the central bright fringe formed in single slit diffraction is twice wider as the first order maxima.

Explanation:

- The bright and dark fringes formed when light passes through double slit have equal widths.
- where as the central bright fringe formed in single slit diffraction is twice wider as the first order maxima

JOIN US ON telegram channel @qubeeacademy

Answer: D

30. In order for interference of light waves to occur, the interfering light waves should
    A. Be incoherent.
    B. Be in phase.
    C. Have constant phase difference and the same frequency and speed.
    D. Be of different.

Explanation: In order to form a sustained interference pattern the light must be coherent.

Answer: A

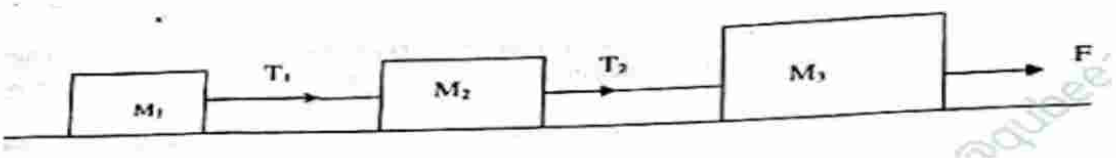
31. Which one of the following is true about fundamental forces?
    A. A weak nuclear force is an extremely short-range force that binds protons and neutrons together in a nucleus.
    B. Electromagnetic force is a long-range attractive force between particles due to their mass.
    C. Gravitational force is a long-range attractive force between particles due to their charge.
    D. Strong nuclear force is a short-range force that holds protons and neutrons to form atomic nucleus.

Explanation: There are four basic forces in nature:

- gravity: purely attractive force, which can act over long distances, due to their masses
- electromagnetism: attractive and repulsive force, which acts on charged particles
- weak nuclear force: acts on the scale of the atomic nucleus
- strong nuclear force: stronger than the electromagnetic force on the scale of the atomic nucleus – keeps protons and neutrons binds together in the nucleus.

Answer: D

32. Three blocks of mass M_1 = 1Kg, M_2 = 2Kg, and M_3 = 3Kg, placed on a horizontal frictionless table, are connected with strings and pulled to the right by a force F = 9N, as shown below. The acceleration a, tensions T1, and T2 are, respectively



    A. a = 2/3 m/s^2, T_1 = 2/3 N and T_2 = 2N.
    B. a = 3/2 m/s^2, T_1 = 3/2 N and T_2 = 9/2 N.

JOIN US ON telegram channel @qubeeacademy

C. a = 3/2 m/s^2, T_1 = 3N and T_2 = 9/2 N.
D. a = 3m/s^2 , T_1 = 3N and T_2 = 9N.

Solution: $F - T_2 = M_3a$

$T_2 - T_1 = M_2a$.

but, $T_1 = M_1a$, then $T_2 = T_1 + M_2a = M_1a + M_2a$

now, $F = T_2 + M_3a = M_1a + M_2a + M_3a$

- $a = \frac{F}{M_1+M_2+M_3} = \frac{9}{1+2+3} = \frac{3}{2} m/s^2$
- $T_1 = M_1a = 1x3/2 = 3/2N$
- $T_2 = T_1 + M_2a = 3/2N + 2x(3/2) = 9/2N$

Answer: B

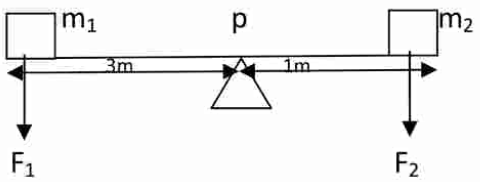
33. which of the following is correct about an astronaut inside an international space station orbiting the earth?
    A. The astronauts experiences weightlessness because the space station and the astronauts are freely falling towards the center of the earth.
    B. Because the earth exerts a larger force on the astronaut than on the space station, the astronaut experienced weightlessness.
    C. Since the earth exerts equal force on both the astronauts and the space, the astronaut experiences weightlessness.
    D. The astronauts experiences weightlessness since the earth's gravitational force on the astronaut is less than the earth's forces on the space station.

Explanation: The astronauts experiences weightlessness since the earth's gravitational force on the astronaut is less than the earth's forces on the space station.

Answer: D

34. Two masses of m1 and m2 are balanced on a horizontal stick of negligible mass pivoted at the center of mass of the system. If the distance from m1 to the center of mass is 3.0m and the distance from the mass m2 to the center of mass is 1.0m, the ratio of m1 to m2 (m1/m2) is?
    A. 3
    B. 1/3
    C. 4/3
    D. 3/4

Explanation:



By using equilibrium conditions the toque at the point p is zero

$T_1 - T_2 = 0$

$T_1 = T_2$

$F_1X_1 = F_2X_2$ where X_1 = 3m and X_2 = 1m

$m_1gx_1 = m_2gx_2$

JOIN US ON telegram channel @qubeeacademy

$$m_1/m_2 = \frac{x_2}{x_1} = \frac{1}{3}$$

Answer: B

35. Identify the correct statement about energy, work, and force.
    A. Machines can multiply energy but not force.
    B. Energy cannot be possessed by an object at rest.
    C. Work is said to be done by a force whenever the force is exerted on an object.
    D. Force is a vector quantity, where as work and energy are scalars.

Explanation:

- Machines can't multiply energy.
- Object may posses potential energy at rest.
- Work is said to be done by a force whenever the force is exerted on an object and moves it some distance.
- Force is a vector quantity, where as work and energy are scalars.

Answer: D

36. Distinguish between conservative and non-conservative forces.
    A. Friction force is an example of conservative force, whereas spring force and gravitational force are typical examples of non-conservative force.
    B. A conservative forces dissipates energy, where as non-conservative force does not.
    C. Work done by conservative force along any closed path is zero, whereas the work done by non-conservative force along a closed path is not zero.
    D. Work done by a conservative force is path dependent, whereas work done by non-conservative force does not depend on the path followed.

Explanation:

- conservative force: a force that does no work when a body moves on a closed path.
  - ✓ Work one is independent of the path.
  - ✓ examples: spring and gravity force.
- Dissipative(non-conservative) force: a force that does work when a body moves on a closed path.
  - ✓ Work done is dependent of the path.
  - ✓ A dissipative force causes mechanical energy to be lost from a body when it is moving
  - ✓ Examples: frictional and drag forces.

Answer: C

37. A crane raises 75.0Kg of bricks from the ground to a height of 45.0m in 52.0s a constant speed. The average power of the crane is?
    A. 14.4 W
    B. 649 W
    C. 3,375 W
    D. 144 W

JOIN US ON telegram channel @qubeeacademy

Solution: P = w/t

$$P=\frac{Fs}{t}=\frac{mgs}{t}=\frac{75x10x45}{52}=649W$$

Answer: B

38. For a rigid body rotating about a fixed axis,
    A. For the same time interval, a point closer to the axis and a point father from the axis travel the same linear distance.
    B. For the same time interval, a point closer to the axis turn through a smaller angle than a point farther from the axis.
    C. A point closer to the axis has smaller linear speed than a point farther from the axis.
    D. A point closer to the axis has greater linear speed than a point father from the axis.

Solution:

- A point closer to the axis has smaller linear speed than a point farther from the axis. Since v = rω ,where v is linear speed, r is s the distance of the point from the axis of rotation and ω is angular speed.

Answer: C

39. A disk of radius 0.10m and mass 0.1Kg is set into motion by a tangential force of 2.0 N applied at the edge of the disk. If the angular acceleration of the disk is 400 rad/s^2, the torque and angular velocity at 2.0 s are, respectively

    A. O.5 Nm and 100 rad/s.
    B. 0.2 Nm and 800 rad/s.
    C. O.2 Nm and 400 rad/s.
    D. O.1 Nm and 200 rad/s.

Solution: $\tau = Fr = 2Nx0.1m = 0.2Nm$

$\omega = \alpha t = 400x2 = 800\,{}^{rad}/_{s}$

Answer:B

40. Identify the correct statement about torque and angular momentum.
    A. No torque acts on an object when its angular momentum increases.
    B. The change in angular momentum is inversely proportional to the torque exerted for a given time interval.
    C. For the same time interval, a small torque and a large torque change angular momentum by the same amount.
    D. A small torque applied for a longer time and a large torque exerted for a shorter time have the same effect on the change of angular momentum.

Solution:

- ✓ The change in angular momentum is directly proportional to the torque exerted for a given time interval. Since ΔL = torque τ × time torque acts for, Δt.
- ✓ A small torque applied for a long time has the same effect as a large force applied for a small time.

JOIN US ON telegram channel @qubeeacademy

Answer: D

41. A scientific method
    A. Is a scientific procedure where a researcher first predicts the result of a problem before proposing the possible hypothesis.
    B. Begins from an accepted scientific theory and concludes with designing an experiment.
    C. Is a scientific procedure which ensures a rigorous evidence-based structure in which only ideas that have been carefully tested are accepted as scientific theory.
    D. Is scientific procedure in which a researcher begins with performing experiments.

Solution: Scientific method:

- ✓ It ensures a rigorous, evidence-based structure where only ideas that have been carefully tested are accepted as scientific theory

Answer: C

42. Which one of the following is correct about accuracy and precision of a measurement?
    A. Accuracy is related to the number of significant figures, whereas precision describes how well we minimizes random errors.
    B. A more accurate measurement has larger uncertainty, whereas a more precise data has smaller uncertainty.
    C. Accuracy describes the closeness of repeatedly measured data to each other, whereas precision describes about the closeness of a data to a true value.
    D. Accuracy refers to the closeness of repeatedly measured data to a true value, whereas precision is related to the closeness of the measured data to each other.

Solution:

- ✓ Accuracy refers to the closeness of repeatedly measured data to a true value,
- ✓ Precision is related to the closeness of the measured data to each other.

Answer: D

43. In an experiment to measure the velocity of a ball rolling along x-axis, a student recorded the distance traveled and time taken by the ball. Which of the following data represent constant velocity of the ball?

JOIN US ON telegram channel @qubeeacademy

A.

x(m)	0	4	5	6	7	9
t(s)	0	1	2	3	4	4

B.

x(m)	0	2	4	6	8	10
t(s)	0	1	2	3	4	5

C.

x(m)	0	3	5	6	7	9
t(s)	0	1	2	3	4	5

D.

x(m)	0	2	3	4	6	7
t(s)	0	1	2	2.5	3	4

Solution: average velocity is displacement divided by time taken.

$$\vec{V}_{av} = \frac{\vec{\Delta s}}{\Delta t}$$

In case of choice B, $\vec{V}_{av} = 2m/s$ its constant.

Answer: B

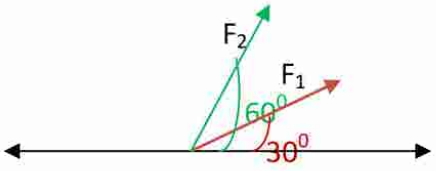
44. A position vector of an object
    A. Is independent of the origin from which it is measured.
    B. Is a measure of how fast it is moving relative to stationary reference frame.
    C. Describes its distance from a point in a specified direction.
    D. Describes its distance from a given point in all directions.

Explanation: A position vector of an object describes its distance from a point in a specified direction

Answer: C

45. Consider two force vectors in x-y plane: F1 = 10N making a 30^0 angle above the horizontal and F2 = 20 N making a 60^0 angle above the horizontal. Which of the following is true?
    A. The direction of their resultant vector is 45^0 above the horizontal.
    B. The magnitude of their resultant is 42 N.
    C. The horizontal and vertical components of their resultant are 18.66N and 22.32N, respectively.
    D. The horizontal and vertical components of their resultant are 15N and 26N, respectively.

Solution:



Given $F_1 = 10N$, $F_2 = 20N$

Horizontal component

- $F_{1x} = F_1\cos 30^0 = i8.66N$

vertical component

$F_{1y} = F_1\sin 30^0 = j5N$

JOIN US ON telegram channel @qubeeacademy

- $F_{2x} = F_2\cos60^0$ = i10N
- $F_{2y} = F_2\sin60^0$ = j17.32N

➢ $\sum F_X = F_{1x} + F_{2x} = 18.66N$ (horizontal resultant)

$\sum F_y = F_{1y} + F_{2y} = j22.32N$ (vertical resultant)

➢ Magnitude of their resultant Fnet = $\sqrt{F_x^2 + F_y^2} = 29.1N$

➢ direction of their resultant vector is, $\theta = \tan^{-1}\frac{F_y}{F_x} = 50.1^0$.

Answer: C

46. Given four vectors **A** = 2i – j, **B** = 4i - 2j, **C** = i – j, **D** = 2i + 3j, which pair of theses vectors are collinear?

A. **C** and **D**
B. **A** and **B**
C. **B** and **C**
D. **A** and **C**

Solution: Collinear vectors are vectors acting on the same line. This vectors can be parallel or anti parallel to each other with the same line of action.

Answer: B

47. While going to school, a student travels 3km, East and then 4km, North in 2 hrs. the magnitude of student's average velocity and average speed are, respectively

A. 2.5 km/hr and 3.5km/hr.
B. 2km/hr and 7km/hr/.
C. 5km/hr and 7km/hr.
D. 3.5km/hr and 2.5km/hr.

Solution: Total displacement = $\sqrt{3^2 + 4^2}$ = 5km.

Total distance = 3km + 3km = 7km.

Total time = 2hrs.

Then, Average velocity $V = \frac{total\ displacement}{total\ time} = \frac{5}{2} = 2.5km/hr$

Average speed $V = \frac{total\ distance}{total\ time} = \frac{7}{2} = 3.5km/hr$

Answer: A

48. A boy throws a ball vertically upward with an initial speed of 20 m/s. Neglecting air resistance, which of the following is true about the motion of the?

A. The time taken to reach the maximum height is 4s.
B. Its velocity after 3s is 50m/s, downward.
C. Its maximum height is 20m.
D. Its velocity after 1s is 30 m/s, upward.

Solution: given initial speed(u) = 20m/s (by assuming upward is positive) and Gravitational acceleration(-10m/s^2) its negative since downward.

➢ V = u + gt
- After 3s, V = 20 + (-10x3) = -10m/s (10m/s downward)
- After 1s, V = 20 + (-10x1) = 10m/s (upward)

➢ Maximum height, $h_{max} = \frac{-u^2}{2g} = \frac{-(20^2)}{2x(-10)} = 20m$

➢ Time taken to reach maximum height, $t = \frac{-u}{g} = \frac{-20}{-10} = 2s$

Answer: C

JOIN US ON telegram channel @qubeeacademy

49. Choose a correct statement about centripetal force and centripetal; acceleration.
    A. For an object moving in a circular path, its centripetal force and centripetal acceleration are parallel and directed toward the centre of the path.
    B. Centripetal acceleration and centripetal force are constant in direction, but vary in magnitude.
    C. Centripetal force on an object moving in a circular path is perpendicular to the radius of the path.
    D. Centripetal force on an object moving in a circular path tends to pull the object outward from its path.

Explanation: For an object moving in a circular path
- ✓ its centripetal force and centripetal acceleration are parallel and directed toward the centre of the path.
- ✓ Centripetal acceleration and centripetal force are constant in magnitude, but vary in magnitude

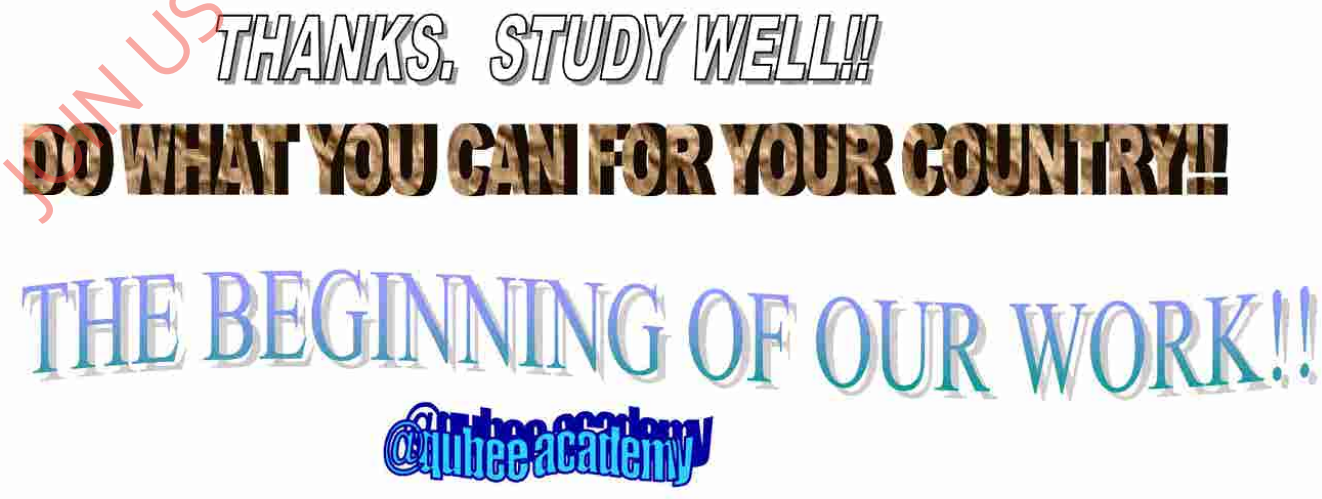
Answer: A

50. According to Newton's law of Universal Gravitation,
    A. The speed of a satellite moving around the Earth in a circular orbit depends on the mass of the satellite.
    B. For two interacting objects, gravitational force exerted on a light object is less than the force on the heavy one.
    C. The period of a satellite orbiting the Earth in a circular orbit increases as the radius of its orbit increases.
    D. The gravitational attraction between two objects is directly proportional to the square of the distance between them.

Explanation: According to Newton's law of Universal Gravitation:
- ✓ The gravitational attraction between two objects is inversely proportional to the square of the distance between them.
- ✓ For two interacting objects, gravitational force exerted on a light object is less than the force on the heavy one.

Answer: B

JOIN US ON telegram channel @qubeeacademy



JOIN US ON telegram channel @qubeeacademy

Join us on telegram @qubeeacademy

QUBEE ACADEMY

EUEE

ANSWER KEY(PDF)

EUEE

PHYSICS 2013/2021

ANSWER WITH EXPLANATION(PDF)

IF YOU WANT MATHS, PHY,BIO,CHEM EUEE ANSWER (PDF) AND MATHS,BIO ,CHEM,PHY MODEL (addisababa) EXAM ANSWER(PDF) JOIN OUR TELEGRAM CHANNEL "@qubeeacademy"

"Do all the good you can,
By all the means you can,
In all the ways you can,
In all the places you can,
At all the times you can,
To all the people you can,
As long as ever you can."

1. Kirchhoff's junction law state that:
   A. Current traversing any closed loop at particular time is zero.
   B. The potential drop at a given junction equals the electromotive force at that particular point.
   C. Charge entering the junction equals the charge leaving that junction at particular time.
   D. The sum of the voltage drop across any closed loop equals the sum of the electromotive force.

   EXPLANATION: Charge entering the junction equals the charge leaving that junction at particular time(i.e. I = Q/t)

   ANSWER: C
2. Which one of the following statement is not correct about the magnetic properties of matter?
   A. There is the tendency to oppose the applied magnetic field in a diamagnetic substance.
   B. The unpaired electrons in diamagnetic materials will align with the applied magnetic field and parallel to each other.
   C. The unpaired electrons in ferromagnetic materials will align with the applied magnetic field and parallel to each other.
   D. The unpaired electrons in paramagnetic substance which will tend to align themselves in the same direction as the applied magnetic field.

   EXPLANATION:
   - **Diamagnetism**: the tendency of a material to oppose an applied magnetic field.
   - **Paramagnetic materials** have unpaired electrons, which will tend to align themselves in the same direction as the applied magnetic field, thus reinforcing it.
   - **Ferromagnetic** materials have unpaired electrons, which will align with the applied magnetic field and parallel to each other. They keep this alignment even when the applied field is removed.

   ANSWER: B
3. Suppose a conductor of length l carrying a current I placed in a uniform magnetic field of magnitude B. when the conductors is making an angle θ with that of the magnetic field then the force experienced by the conductor due to the magnetic field is given by:
   A. $\vec{F} = I(\vec{B}x\vec{l})$
   B. $\vec{F} = BIlcos\theta$
   C. $\vec{F} = BIltan\theta$
   D. $\vec{F} = I(\vec{l}x\vec{B})$

   EXPLANATION:
   - ✓ The expression $\vec{F} = I(\vec{l}x\vec{B})$ is used to find the force on a current−carrying conductor in a magnetic field.

   ANSWER: D
4. Which one of the following statement is correct about tangent galvanometer?
   A. The current through the coil of the wire generates a magnetic field at the center of the coil.

@qubeeacademy

B. It consists of a coil of insulated copper wire on a circular magnetic frame.
C. The current is inversely proportional to the tangent of the angle of the needle's deflection.
D. It is a device used to measure the electric current in terms of the electric field it produces.

EXPLANATION:

- ✓ The tangent galvanometer (TG) is an instrument for measuring the strength of an electrical current in terms of the magnetic field it produces.
- ✓ The current is proportional to the tangent of the angle of the needle's deflection.
- ✓ Current flowing through a coil of wire generates a magnetic field at the centre of a coil, and this field deflects a magnetic compass needle.

ANSWER: A

5. A long conductor shown in the figure carries current I in the direction indicated by the arrow.



Which statement is **NOT** correct about the magnetic field produced by this current carrying conductor?

A. Doubling the current through the conductor doubles the field strength.
B. Reversing the current direction will reverse the direction of the magnetic field.
C. The magnetic field encircles the conductor.
D. The field strength is directly proportional to the distance from the conductor.

EXPLANATION:

- ✓ The magnetic field encircles the conductor.
- ✓ Reversing the current direction will reverse the direction of the magnetic field.
- ✓ The strength of the magnetic field, B, depends on:
  - The current, I, flowing through the conductor(i.e. if I doubles the B also double).
  - The inverse of the distance from the conductor, r (in other words, as the distance from the conductor increases, the strength of the field decreases).
- ✓ Mathematically: $\frac{\mu_0 I}{2\pi r}$.

ANSWER: D

6. A coiled copper has 50 turns and coil cross-sectional area of 9 x 10^{-4} m^2. This coil is initially placed in a uniform magnetic field 0.02 T and pulled out of a field completely (where the field is zero) in 0.5 seconds. What is the magnitude of the induced electromotive force?

A. 3.2 mV
B. 9.0 mV
C. 18 mV
D. 1.8 mV

@qubeeacademy

SOLUTION:

Given: B = 0.02 T, $\Delta t = 0.5s$, A = 9 x 10^{-4} m^2 , N = 50 turns

ε =?

Then, $\varepsilon = \frac{N\Delta(AB)}{\Delta t} = \frac{50x9x10^{-4}x0.02}{0.5} = 1.8mV$

ANSWER: D

7. A 15 mH inductor is used to indicate an electromotive force of 5.0 mV. What is the rate change of the induced current?

A. 3.0 A/s
B. 0.30 A/s
C. 0.33 A/s
D. 3.3 A/s

SOLUTION:

Given: L = 15 mH, $\varepsilon = 5.0\ mV$, $\frac{\Delta I}{\Delta t} = ?$

$\Rightarrow \quad \varepsilon = -L\frac{\Delta I}{\Delta t}$

$\Rightarrow \frac{\Delta I}{\Delta t} = \frac{-\varepsilon}{L} = \frac{5.0mV}{15mH} = 0.33A/s$

ANSWER: C

8. A coil and permanent magnet are set in relative motion. Which one of the following statement is **NOT** correct about induced electromotive force?

A. Coil with larger number of turns produce greater induced electromotive forces.
B. Moving a magnet relative to the coil and the coil relative to the magnet with equal speed will produce the same electromotive force.
C. The magnitude of the induced electromotive is directly proportional to the relative velocity between the two.
D. The direction in which the coil moves relative to the magnetic field does not have any effect on the induced electromotive force.

ANSWER: D

9. What is the advantage of using alternating current in transmission electric energy?

A. It enables to reach the consumers at very high voltage.
B. It enables a transformer to increase or decrease the voltage as required.
C. It completely avoids energy loss due to heating.
D. It uses very high current in the transmission line.

EXPLANATION:

✓ It enables a transformer to increase or decrease the voltage as required.

ANSWER: B

10. Capacitive reactance is defined as

A. The equivalent quantity to resistance when we are talking about capacitors.
B. The equivalent quantity to impedance of in RLC circuit.
C. The equivalent quantity to resistance when we are talking about inductors.
D. The equivalent quantity to resistance when we are talking about resistors.

EXPLANATION:

✓ **Capacitive reactance** is the equivalent quantity to resistance when we are talking about capacitors.

@qubeeacademy

ANSWER: A

11. The second law of thermodynamics states that
    A. The increase in the internal energy of s system is equal to the sum of the energy entering the system through heating, and work done on the system.
    B. Two bodies that are separately in thermal equilibrium with a third body must be in the thermal equilibrium with each other.
    C. No process is possible in which there is an overall decrease in the entropy of the universe.
    D. No process is possible in which there is an overall increase in the entropy of the universe.

EXPLANATION:

- ✓ **The second law of thermodynamics** states that no process is possible in which there is an overall decrease in the entropy of the universe.

ANSWER: C

12. A mass-spring system set to oscillate in a simple harmonic motion over friction less horizontal surface. Amplitude of this oscillation is 20 cm. a second mass-spring system with the same spring constant is set to oscillate in the same way but with amplitude of 10 cm. The energy of the
    A. First mass-spring system has four times the second one.
    B. Second mass-spring system has the square of the first one.
    C. First mass-spring system has twice the second one.
    D. Second mass-spring system has half of the first one.

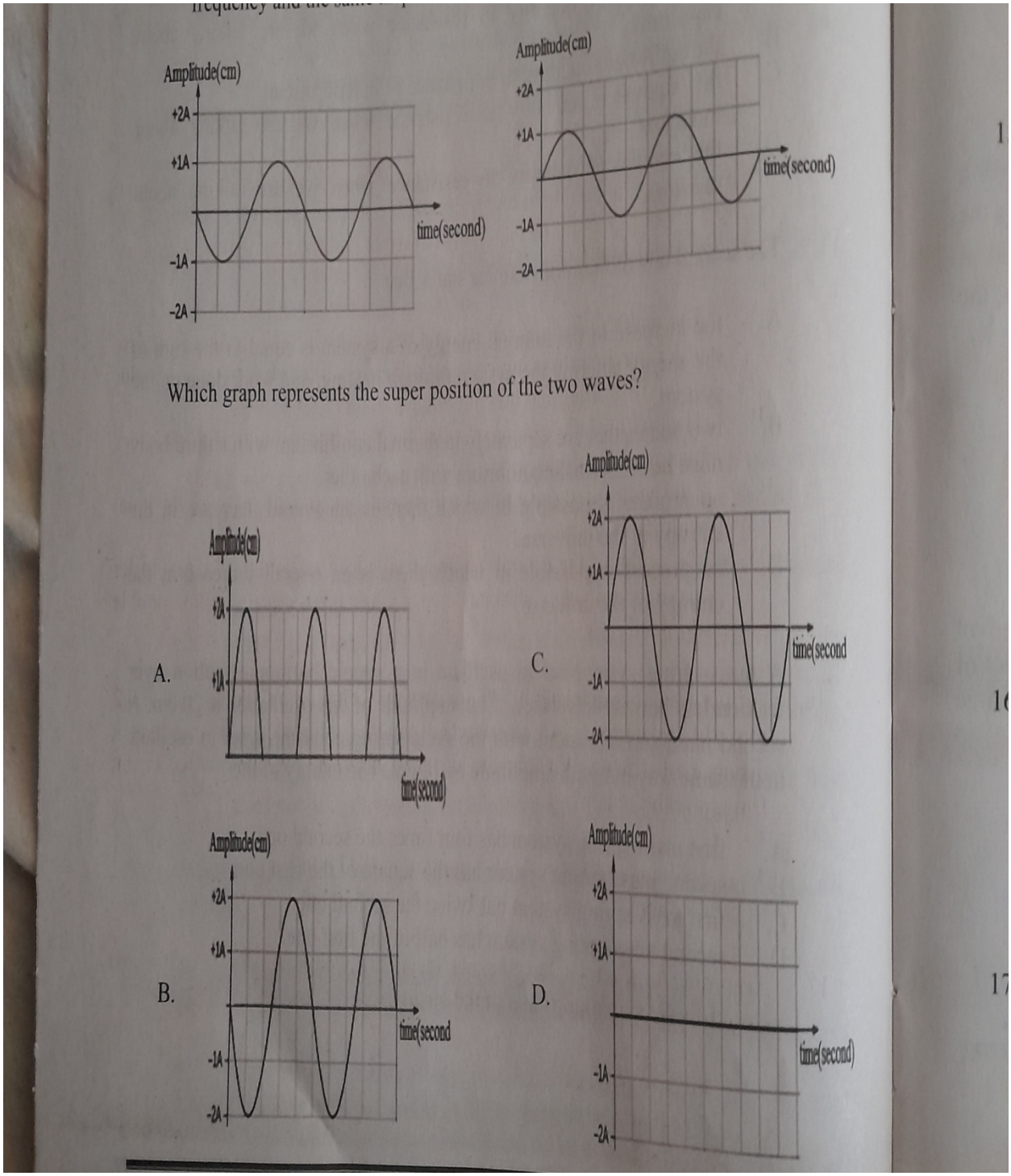
EXPLANATION:

- ✓ The energy of the mass-spring system is given by: $E = \frac{1}{2}kA^2$
  - Where k is spring constant, it's the same for this question.
  - A is amplitude of the oscillation.
- ✓ Thus for the first one: $E_1 = \frac{1}{2}kA^2 = 0.5xkx(0.2)^2 = 0.02k$
- ✓ For the second one: $E_2 = \frac{1}{2}kA^2 = 0.5xkx(0.1)^2 = 0.005k$
- ✓ Therefore, $E_1 = 4E_2$.

ANSWER: A

@qubeeacademy

13. Suppose you are given the following travelling waves that have the same frequency and the same amplitude A.



Which graph represents the super position of the two waves?

A.

C.

B.

D.

EXPLANATION:

- ✓ If the two oscillations are in anti phase we get destructive interference or cancellation leading to a small or zero resultant oscillation.
- ✓ Note that we only get complete cancellation if the two oscillations are in perfect anti phase and have the same amplitude.
- ✓ As we see from the graph the oscillations are anti phase to each other.

ANSWER: D

14. A string vibrates with speed of 110 m/s in its fourth harmonic has a frequency of 880 Hz. What is the length of the string?

A. 25.0 cm C. 50.0 cm
B. 12.5 cm D. 31.3 cm

SOLUTION:

Given: v = 110 m/s , f = 880 Hz, n = 4.

The fundamental frequency is given by: $f = \frac{V}{2L}$.

Thus, $L = \frac{nV}{2f} = \frac{4x110}{2x880} = 0.25m = 25.0\ cm$

ANSWER: A

15. An interference patterns observed after a monochromatic beam of light passes through a single slit and a double slit. Which one of the following is correct about the width of the central maxima and the first order maxima in a single slit and double slit?

A. The width of the central maxima has equal with the width of the first order maxima in a single slit interference while it has twice the width of the first order maxima in double slit interference.
B. The width of the central maxima has twice the width of the first order maxima in both cases.
C. The width of the central maxima and first order maxima has equal width in both cases.
D. The width of the central maxima has twice the width of the first maxima in a single slit interference while it has equal width in double slit interference.

EXPLANATION:

- ✓ The width of the central maxima has twice the width of the first maxima in a single slit interference while it has equal width in double slit interference.

ANSWER: D

16. A light wave of wavelength 590 nm pass through a narrow double slit of 0.2 mm slit separation. An interference pattern is formed on a screen at a distance of 1.5 m. What is the distance between the consecutive bright fringes on the screen ?

A. 1.97 mm C. 0.43 mm
B. 4.43 mm D. 44.3 mm

SOLUTION:

- ✓ We know that the wavelength **λ**, the fringe separation **w**, the slit separation **s** and the distance **D** from the slits to the screen are related by the equation: $\frac{\lambda}{s} = \frac{w}{D}$.
- ✓ From the question s = 0.2mm, D = 1.5m = 1500mm, $\lambda = 590nm =$ $5.9x10^{-4}$ mm

@qubeeacademy

✓ $W = \frac{\lambda D}{s} = \frac{5.9x10^{-4}x150}{0.2} mm = 4.43mm$

ANSWER: B

17. According to Gauss's law the net electric flux through any hypothetical closed surface is proportional to the enclosed:
    A. Electric field.
    B. Potential difference.
    C. Electric current.
    D. Electric charge.

EXPLANATION:

✓ **Gauss's law**: law stating that the electric flux though any closed surface is proportional to the enclosed electric charge.

ANSWER: D

18. When a dielectric material placed between two parallel metal plates in the presence of electric fields they enable the plates to store.
    A. Much less charge at different potential difference.
    B. The same charge at the same potential difference.
    C. Much more charge at the same potential difference.
    D. Much more charge at different potential difference.

EXPLANATION:

✓ A dielectric material is an insulating material with properties that allow more charge to be stored. Dielectrics contain a number of dipoles.

✓ The use of a dielectric dramatically increases the permittivity of the region in between the plates and so allows much more charge to be stored at the same p.d.

ANSWER: C

19. A parallel plate capacitor with plate area A and plates separation d stores a charge Q when a potential V is kept between the plates. Then the region between the plates is completely filled with a dielectric material of dielectric constant ε_r. If E denotes the dielectric field between the plates, the energy density stored by the capacitor is.
    A. $u = \frac{1}{2}\varepsilon_o\varepsilon_r E^2$
    B. $u = \frac{\varepsilon_o\varepsilon_r QV^2}{Ad}$
    C. $u = \frac{1}{2}\varepsilon_r EQ^2V$
    D. $u = \frac{\varepsilon_o\varepsilon_r V^2A}{2dE}$

EXPLANATION:

✓ For any given parallel plate capacitor the electrical energy density is Proportional to the dielectric constant and the square of the electric field strength between the plates.

✓ $u = \frac{1}{2}\varepsilon_o\varepsilon_r E^2$

ANSWER: A

20. A uniform conductor of length and cross-sectional area A carries a current. I when a potential difference per unit volume of the conductor is applied across its end. If the number of free electrons per unit volume of the conductor is n, and the electron charge is e, then the drift velocity of the electrons in the conductor is.
    A. $V_d = \frac{I}{eLA}$
    B. $V_d = \frac{I}{neA}$
    C. $V_d = \frac{I}{neLA}$
    D. $V_d = \frac{I}{neL}$

@qubeeacademy

EXPLANATION:

- ✓ We can find an equation for drift velocity by beginning with the definition of current: $\frac{\Delta Q}{\Delta t}$
- ✓ Where ΔQ is the small amount of charge that passes through an area in a Small unit of time, Δt.

However, ΔQ = (number of charged particles) × (charge per particle) = (nAΔx)q

Where

- n is the number of charge carriers per unit volume
- A is the cross-sectional area
- Δx is a small length along the wire
- q is the charge of the charge carriers(electron (e) in this case).

- ✓ We know that under the influence of an electric field in the wire, the charge carriers gain an average velocity in a specific direction, the drift velocity, vd . Since Δx = vdΔt, the above equation becomes

Therefore, ΔQ = (nAvdΔt)e We now put this back into the original equation for current and rearrange it so that drift velocity is the subject:

- ➢ $Vd = \frac{I}{enA}$

ANSWER: B

21. A student wants to measure the length and height of the school laboratory. There are vernier calipers, meter stick, micrometer screw gauge and meter tape measuring instruments in the laboratory. Which one of the following measuring instrument and units is appropriate for the measurement?
    A. Meter tape and meter.
    B. Vernier calipers and millimeter.
    C. Micrometer screw gauge and millimeter.
    D. Meter stick and centimeter.

ANSWER: D

22. In reporting an experimental result the collected data has to be clearly tabulated with approximate units. Which of the following table correctly represents a data collected during an experiment?

@qubeeacademy

A.

Voltage	4 V	6 V	8 V	12 V	16 V
Current	0.5 I	0.75 I	1I	1.5 I	2.0 I

B.

Voltage (V)	4	6	8	12	16
Current (C)	0.5	0.75	1	1.5	2.0

C.

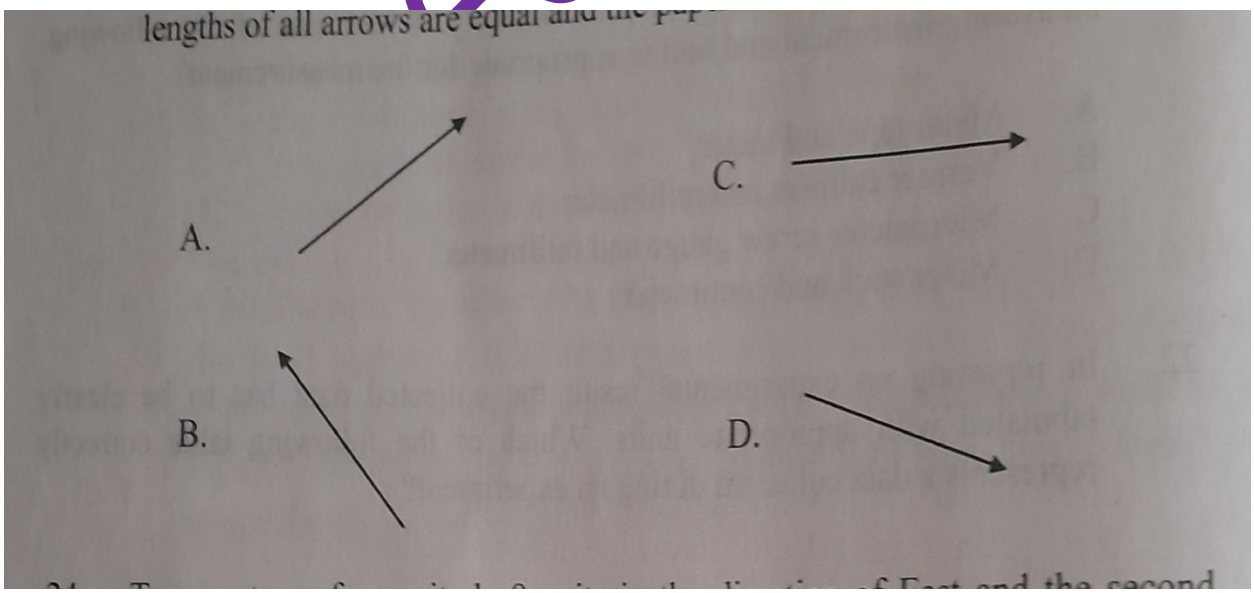
Voltage (V)	4	6	8	12	16
Current (A)	0.5	0.75	1	1.5	2.0

D.

Voltage	4 V	6 V	8 V	12 V	16 V
Current	0.5 C	0.75 C	1 C	1.5 C	2.0 C

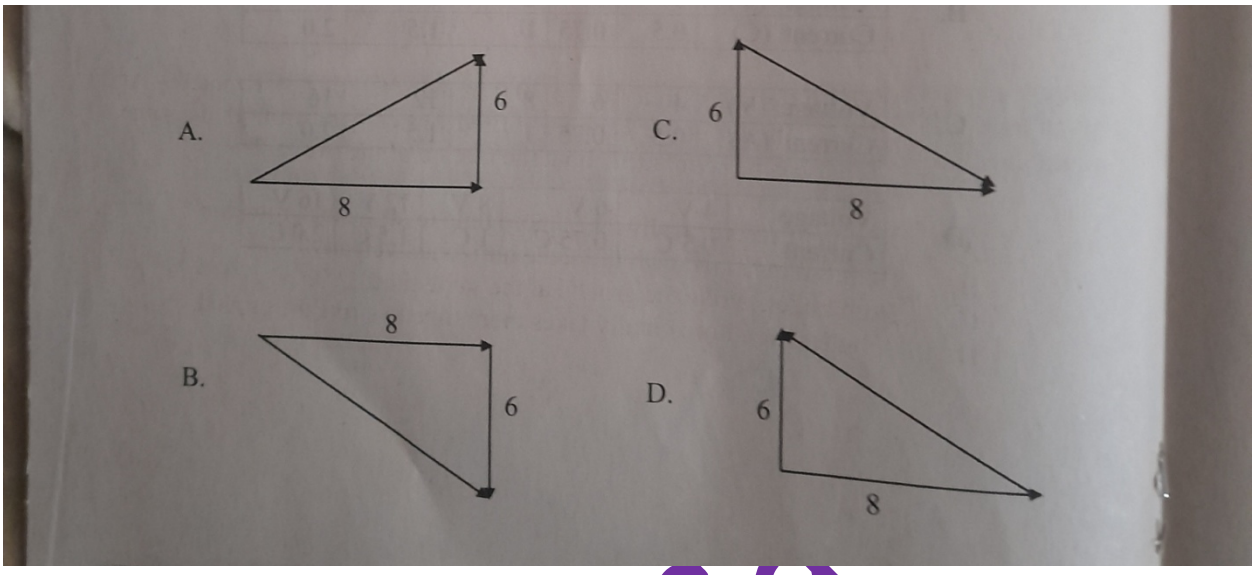
ANSWER:C

23. A 10 N force is applied in the direction of North-East, which of the following graphical representation of the force is correct? (assume the lengths of all arrows are equal and the paper head points towards North)



ANSWER:A

24. Two vectors of magnitude 8 units in the direction of East and the second vector of magnitude 6 units in the direction of North are given. If you add the two vectors using graphical method, which graph represents the resultant of the two vectors?



ANSWER:A

25. Which of the following pair of vectors are collinear?

A. $\begin{bmatrix}4\\2\end{bmatrix}, \begin{bmatrix}-4\\-2\end{bmatrix}$

C. $\begin{bmatrix}4\\2\end{bmatrix}, \begin{bmatrix}4\\-2\end{bmatrix}$

B. $\begin{bmatrix}4\\2\end{bmatrix}, \begin{bmatrix}-4\\2\end{bmatrix}$

D. $\begin{bmatrix}-4\\-2\end{bmatrix}, \begin{bmatrix}4\\-2\end{bmatrix}$

EXPLANATION:

- ✓ Two vectors are said to be collinear if the are parallel or anti parallel.
- ✓ Two vectors are parallel if one of the vector is scalar product of the other (i.e., $\mathbf{V} // \mathbf{U}$, if $\mathbf{V} = n\mathbf{U}$ where **V** and **U** is any vector and n is any real Number.)

ANSWER: A

26. Instantaneous velocity is different from average velocity in that; instantaneous velocity is

A. The velocity at particular instant of time.
B. In opposite direction to the displacement of the moving object.
C. The total displacement to the time taken.
D. The average velocity during the time of acceleration.

EXPLANATION:

- ✓ Average velocity is the total displacement, or distance travelled in a specified direction, divided by the total time taken to travel the displacement
- ✓ Instantaneous velocity is the velocity at particular instant of time.

@qubeeacademy

ANSWER: A

27. A car travelling at 20m/s starts to speed up. After 5 minutes its speed is 144m/s. what is the acceleration of the car?
    A. 28.8 m/s^2 C. 24.8 m/s^2
    B. 0.4 m/s^2 D. 0.55 m/s^2

SOLUTION:

$$a = \frac{V_2 - V_1}{t} = \frac{144-20}{5x60} = 0.4133 m/s^2$$

ANSWER: B

28. A bullet of 200 g mass fired from a 30.0 m high building, horizontally. At the same time a bullet of the same mass fired vertically down from the same height. What can be concluded about the motion of the two bullets?
    A. A bullet fired vertically takes more time to strike the ground.
    B. Both bullets move with the same horizontal velocity.
    C. Both bullets strike the ground at the same time.
    D. A bullet fired horizontally takes more time to strike the ground.

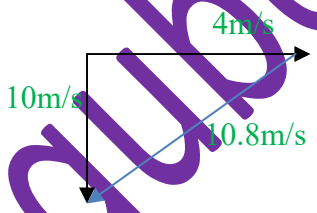
EXPLANATION:

✓ Both bullets strike the ground at the same time.

ANSWER: C

29. A bird flies at speed of 10 m/s to south relative to the earth. A wind blows at speed of 4 m/s to East relative to the Earth. What is the speed of the bird relative to the wind?
    A. 6 m/s in the direction of North-East.
    B. 10.8 m/s in the direction of North-West.
    C. 6 m/s in the direction of South-West.
    D. 10.8 m/s in the direction of South-West.

EXPLANATION:



ANSWER: D

30. Dynamics is a branch of mechanics concerned with the motion of an object
    A. Under the action of forces.
    B. Under the action of balanced forces.
    C. Without its causes.
    D. Whose velocity is constant.

EXPLANATION:

✓ Dynamics is a branch of mechanics concerned with the motion of an object Under the action of forces.

ANSWER: A

31. Which one of the following statement is correct about, a bar on which a force acts at one end and pivoted at the other?

@qubeeacademy

A. The force is parallel to the angular acceleration produced.
B. The force, angular velocity and the torque are coplanar.
C. The force is coplanar with the torque it produces.
D. The force is collinear with the angular velocity.

EXPLANATION:

ANSWER:

32. The necessary condition for an object to be in rotational equilibrium is?
A. The net moment of all forces should be non-zero.
B. The net torque acting on the object is different from zero.
C. The net force exerting on the object must be zero.
D. The sum of clockwise torques equals to the sum of counter clockwise torques.

EXPLANATION: The necessary condition for an object to be in rotational Equilibrium is the sum of clockwise torques equals to the sum of Counter clockwise torques.

ANSWER: D

33. An aluminum wire of initial length 2.0 m where increased by 2.0 cm in its length being on application of a force of 9.0N. What is the strain energy of the material.
A. 0.18 J
B. 0.9 J
C. 9.0×10^{-2} J
D. 4.5×10^{-2} J

SOLUTION: Given: F = 9N, L = 2m, x(extension) = 2cm = 0.02m.

Strain energy = $\frac{1}{2}$ Fx = 0.5x9Nx0.02m = 9.0×10^{-2} J.

ANSWER: C

34. Ethanol has a surface tension of 22×10^{-3} N/m and its density is of 0.789 g/cm^3. The radius of the capillary tube is 15 mm, and the contact angle is 30°. Determine the height rise in the column of the capillary tube.
A. 0.32 mm
B. 0.16 mm
C. 3.2 mm
D. 1.6 mm

SOLUTION: Given: • f (surface tension) = 22×10^{-3} N/m
• θ (the contact angle)= 30°
• ρ (density of liquid) = 0.789 g/cm^3 = 789 Kg/m^3
• g 10m/s2 • r (radius of tube) = 5mm = 0.015m.

$$h = \frac{2f\cos\theta}{\rho g r} = \frac{2x22x10^{-3}x\cos 30}{789x10x0.015} = 0.32mm$$

ANSWER: A

35. Suppose a stream of fluid flows past a solid object, which one of the following does **NOT** affect the laminar flow of the fluid?
A. Viscosity of the fluid.
B. The density of the solid object.
C. The shape of the solid object.
D. The speed of the solid object.

EXPLANATION: There are four properties of air that affect the way it flows past an object:
✓ density,

@qubeeacademy

- ✓ compressibility (how much its volume can be reduced),
- ✓ temperature and
- ✓ viscosity

ANSWER: C

36. Water enters a tube of non-uniform diameter. The speed of the force at the entry of area A_1 is 12m/s and the speed becomes 4m/s at the exit opening of area A_2. Which one is correct about the ratio of $\frac{A_1}{A_2}$?

A. 4
B. ¼
C. 1/3
D. 3

EXPLANATION:

- ✓ From continuity equation volume flow rate in is equal with volume fow rate out.
- ✓ Thus, $A_1V_1 = A_2V_2 \Longrightarrow \frac{A_1}{A_2} = \frac{V_2}{A_1} = 1/3$

ANSWER: C

37. The particular temperature and pressure at which the solid, liquid, and gaseous phases of a given substances are all at equilibrium with another is known as:

A. Triple point
B. Heat capacity
C. Phase change
D. Critical point

EXPLANATION:

- ✓ The particular temperature and pressure at which the solid, liquid, and gaseous phases of a given substances are all at equilibrium with another is known as **Triple point**.
- ✓ The **critical point** occurs where the critical temperature and critical pressure of a substance meet.

ANSWER: A

38. Most solids expand upon heating, which one of the following statements correctly describe the phenomena?

A. Increase in temperature increases the vibrational kinetic energy and decreases the amplitude of the atoms constructing the solid.
B. Increase in temperature decreases the vibrational kinetic energy and increases the amplitude of the atoms constituting the solid.
C. Increase in temperature decreases the vibrational kinetic energy and amplitude of the atoms constituting the solid.
D. Increase in temperature increases the vibrational kinetic energy and amplitude of the atoms constituting the solid.

EXPLANATION: Increase in temperature increases the vibrational kinetic energy and decreases the amplitude of the atoms constructing the solid.

ANSWER: A

39. If 25 J is taken away by heat from a system, and the system does 20 J of work, what is the change in internal energy of the system?

A. -45.0 J
B. 45.0 J
C. -5.0 J
D. 5.0 J

SOLUTION:

- ✓ Given W = -20 J, $\Delta Q = -25\,J$

@qubeeacademy

- ✓ $\Delta U = \Delta Q + W = -45J$

ANSWER: A

40. A sample mixture of gas contains 72% of hydrogen and 28% of Helium. What is the partial pressure of helium at an atmospheric pressure of 76 cm of mercury (Hg)?
    A. 33.44 cm Hg
    B. 76.0 cm of Hg
    C. 54.72 cm of Hg
    D. 21.28 cm of Hg

SOLUTION:

ANSWER:

41. Which one of the following statement is **NOT** correct about the concept and units of coefficient of friction?
    A. Coefficient of friction is the ratio of frictional force to normal force.
    B. Coefficient of static friction is less than its value of kinetic friction.
    C. Coefficient of static friction has no unit.
    D. The coefficient is always less or equal to unity(1).

SOLUTION:

- ✓ Coefficient of friction is the ratio of frictional force to normal force.
- ✓ Coefficient of static friction has no unit.
- ✓ Coefficient of kinetic friction is less than its value of static friction.
- ✓ The coefficient is always less or equal to unity(1).

ANSWER: B

42. A car is travelling at constant velocity along a straight line. Which, statement is correct?
    A. The displacement of the car increase linearly with time.
    B. The displacement of the car is in opposite direction.
    C. The net force on the car is different from zero.
    D. Acceleration of the car is in opposite direction.

EXPLANATION:

- ✓ When an object travels at constant velocity its displacement increases linearly with time.
- ✓ Since acceleration is rate change of velocity, for constant velocity, acceleration is zero, thus force also zero.

ANSWER: A

43. Which one of the following statements is correct about the impulse on an object?
    A. The impulse on an object is changed when the net force acting on the object is zero.
    B. The area under the curve of momentum versus time graph is the impulse on an object.
    C. Impulse is the change in momentum when a force is exerted on an object for a very short period of time.
    D. Impulse is the rate of change in momentum due to external force exerted on an object for a very short period of time.

EXPLANATION:

- ✓ Impulse is the change in momentum when a force is exerted on an object for a very short period of time.

@qubeeacademy

ANSWER

44. Consider two collisions, that occurred between two trollies having the same mass; moving with the same speed, and in opposite directions,

Collision 1:- after collision the two trollies bounce back with the same speed.
Collision 2:- after collision the two trollies stick together due to magnetic coupler.
Which of the following statement is correct about the two collisions?

A. Both collisions are elastic.
B. Collision 1 is elastic and collision 2 is inelastic.
C. Both collision are inelastic.
D. Collision 1 is inelastic and collision 2 is elastic.

EXPLANATION:

- ✓ When two bodies collide and stick together, the collision is said to be perfectly inelastic collision.
- ✓ When two bodies collide and go differently, the collision is said to be perfectly elastic collision

ANSWER: B

45. Suppose that you are given a mass attached to a spring and oscillates up and down. This mass-spring system has maximum gravitational potential energy(GPE), elastic potential energy (EPE) and kinetic energy (KE) at the

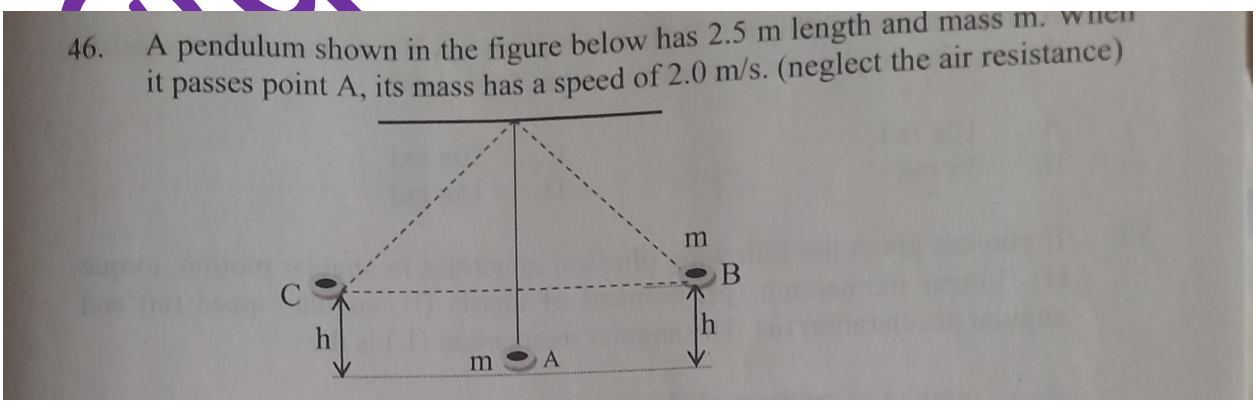
A. Middle, top and bottom respectively.
B. Middle, bottom and top respectively.
C. Bottom, middle and top respectively.
D. Top, bottom and middle respectively.

EXPLANATION:

- ✓ An object has more potential energy at higher position(height) thus mass has maximum GPE at the top.
- ✓ An object has more EPE when the spring stretches, thus the mass has maximum EPE at the bottom.

ANSWER:B

46. A pendulum shown in the figure below has 2.5 m length and mass m. when it passes point A, its mass has a speed of 2.0 m/s. (neglect the air resistance)



Qubeeacademy

The height of the pendulum at displacement positions B and C is

A. 0.1 m
C. 0.2 m
B. 2.5 m
D. 0.4 m

SOLUTION:

- ✓ Given v = 2m/s, g =10m/s2, l =2.5m
- ✓ You know that at point B and C the pendulum has potential energy only.
- ✓ And also you know that at point A it has kinetic energy only.
- ✓ Thus by using conservation of energy law we have:

KE = GPE

$$\frac{1}{2}mv^2 = mgh$$

$$h = \frac{v^2}{2g} = 0.2\text{m}$$

ANSWER: C

47. A 5.0 kg stone is dropped from a top of 30.0 m building. At a height of 10.0 m above the ground, 60 % of its initial potential energy is converted to kinetic energy. Which one of the following statements is correct about the transformation of energy for the stone?

A. The sum of its potential energy and kinetic energy is the same at every point during its fall.
B. 6.7 % of its gravitational potential energy is dissipated due to air resistance.
C. 60 % of its original potential energy is converted to heat energy due to air resistance.
D. The remaining 40% of the energy is still available as gravitational potential energy.

EXPLANATION:

- ✓ From conservation energy law: energy cannot be created or destroyed. Thus, at height of 10.0 m from the ground, the remaining 40% of the energy is still available as gravitational potential energy.

ANSWER: D

48. A force of $\begin{bmatrix}3\\4\end{bmatrix}$ N acts at a displacement of $\begin{bmatrix}4\\3\end{bmatrix}$ m. The magnitude and the direction of the torque produced is

A. -7.0 N.m K
C. 24.0 N.m K
B. -24.0 N.m K
D. 7.0 N.m K

SOLUTION:

Torque = rxF ,Where r is displacement and F is force.

Torque = $\begin{bmatrix}4\\3\end{bmatrix} x \begin{bmatrix}3\\4\end{bmatrix}$= 7.0 N.m K

ANSWER: D

49. A wheel starts rotating at 1.2 Hz and reaches 1.8 Hz in 5 seconds. Calculate the angular displacement it covers within 5 seconds?

A. 10π rad
C. 30π rad
B. 3π rad
D. 15π rad

@qubeeacademy

SOLUTION:

- ✓ Given f1 = 1.2 Hz and f2 = 1.8 Hz , t = 5sec
- ✓ $\omega_1 = 2\pi f_1 = 2\pi x 1.2 = 2.4\pi rad/s$
- ✓ $\omega_2 = 2\pi f_2 = 2\pi x 1.8 = 3.6\pi rad/s$
- ✓ Then $\theta = \left(\frac{(\omega_1+\omega_2)}{2}\right) t = 15\pi$ rad

ANSWER: D

50. If you are given the following physical quantities in angular motion: torque(τ), Linear momentum (p), moment of inertia (I), angular speed (ω) and angular acceleration (α). The angular momentum (L) is the.
    A. Product of moment of inertia and angular speed.
    B. Ratio of moment of inertia to angular acceleration.
    C. Product of moment of inertia and torque.
    D. Ratio of linear momentum to moment of inertia.

EXPLANATION:

- ✓ The angular momentum of a rotating body is given as: L = I ω
- ✓ Thus The angular momentum (L) is the Product of moment of inertia and angular speed.

ANSWER: A

@qubeeacademy