EDUCATIONAL ASSESMENT AND EXAMINATIONS SERVICE (EAES)

ETHIOPIAN SECONDARY SCHOOL PILOT TEST (ESSPT)

GINBOT, 2016 E.C/MAY, 2024 G.C

SUBJECT CODE : 04 **BOOKET CODE : 011**

NUMBER OF ITEM : 60 **TIME ALLOWED : 2:30 HOURS**

You may refer to the information given below when you need to work on some of the questions

Name of constants	Symbol	Value
Acceleration due to gravity	G	$10\ {}^{m}/_{s^2}$
Mass of proton	$\boldsymbol{m_p}$	$1.67\ x\ 10^{-27}\ Kg$
The charge of electron	$\boldsymbol{e^-}$	$1.6\ x\ 10^{-19} C$
Mass of electron	$\boldsymbol{m_e}$	$9.11\ x\ 10^{-31} Kg$
Universal gravitational constant	G	$6.67\ x\ 10^{-11}\ {}^{Nm^2}/_{Kg^2}$
Mass of Earth	$\boldsymbol{M_E}$	$6\ x\ 10^{24} Kg$
Radius of Earth	$\boldsymbol{R_E}$	$6.4\ x\ 10^{6}\ m$
Density of water	$\boldsymbol{\rho}$	$1000\ {}^{Kg}/_{m^3}$
Molar gas constant	R	$8.314\ {}^{J}/_{mol\ K}$
Permittivity of vacuum	$\boldsymbol{\varepsilon_0}$	$8.85\ x\ 10^{-12}\ {}^{F}/_{m}$
Magnetic Permeability of free space	$\boldsymbol{\mu_0}$	$4\pi\ x\ 10^{-7}\ {}^{Tm}/_{A}$
Coulomb's constant	K	$9\ x\ 10^{9}\ {}^{Nm^2}/_{C^2}$
Plank's constant	H	$6.63\ x\ 10^{-34}\ Js$
$\sin 30° = \cos 60° = 0.5$		
$\sin 60° = \cos 30° = 0.87$		
$\sin 37° = \cos 53° = 0.6$		
$\sin 53° = \cos 37° = 0.8$		



© Mesob Platforms™

This work is licensed under a Creative Commons Attribution-Adaptations Allowed 4.0 International License. (You can find the full legal code here: [https://creativecommons.org/licenses/by-sa/4.0/legalcode].) **You** can Share and re-mix this document, even for commercial purposes. Adapt and alter this document to suit your needs. You must Attribute the original work: Please clearly credit this document as "011 Physics 2016 Pilot Exam " by Mesob Academy. You can include a link to the original document (if available) and/or to Mesob Platforms for more information. This document is encrypted with a 256-bits password that prevents you from editing it's contents with known adobe or other acrobat and pdf readers. If you are a content creator wish to by pass and edit the contents of this document, please contact Mesob Academy for the encryption key. If you adapt or remix this document, you must distribute the result under the same license as the original. No guarantees, This license does not grant any rights to trade names, trademarks, or registered designs, nor does it imply any endorsement by Mesob Platforms. You are responsible for any consequences of using this document. The license and this document are provided "as is" without any warranties or representations.

Contact for further clarification or permission to use beyond the scope of this license:
Email: mailto:mesobplatforms@hotmail.com
Website: www.mesobplatforms.rf.gd
By using this document, you agree to the terms of this Creative Commons license.

Powered by

Mesob Platforms™

www.mesobplatforms.rf.gd

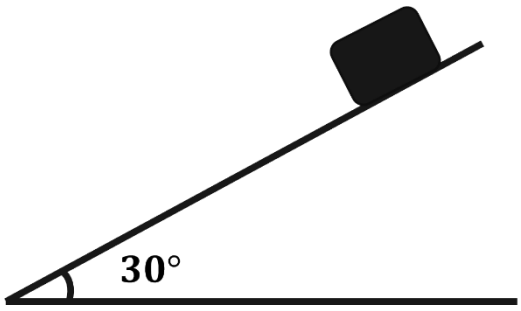


1. A car moves 6Km North and then 8 km East, what is the resultant displacement of the car?
   A. 2km North
   B. 2km East
   C. 10 km 37◦ North of East
   D. 10 km 53◦ North of East

2. Which one of the following types of motion represents a uniformly accelerated motion?
   A. Free falling object
   B. A mass attached on a spring oscillating on a smooth horizontal surface
   C. A car moving along a curved path at a constant speed.
   D. A car moving in a straight line with constantly increasing acceleration

3. Starting from rest, a car accelerated uniformly with 2.5 $^{m}/_{s^2}$. How much distance should it travel to attain a speed of 180 $^{km}/_{h}$ in the direction of acceleration?
   A. 5 km
   B. 100 m
   C. 10km
   D. 500 m

4. A teacher is teaching students about static friction by putting a box on horizontal planes as shown in the figure below. The box remained at rest until the angle of inclination of the box is 30° to the horizontal.



What is the value of the coefficient of static friction of the inclined plane?

A. 0.50
B. 0.58
C. 0.87
D. 1.722

5. If object A exerts a force on object B, then B will also exert a force of equal magnitude but opposite in directions on A. This is a statement of
   A. Newton's first law of motion
   B. Newton's second law of motion
   C. Newton's third law of motion
   D. Newton's law of gravitation

6. A 7 kg block placed on a smooth horizontal surface is acted up on by two forces of magnitude 21 N and 7 N.of mass is pulled by two ropes. If the two forces act horizontally in the same direction, what is the magnitude of the acceleration of the block?
   A. $1\ {}^{m}/_{s^2}$ C. $3\ {}^{m}/_{s^2}$
   B. $2\ {}^{m}/_{s^2}$ D. $4\ {}^{m}/_{s^2}$

7. Two cars, A of mass 1200 kg and B of mass 3000 kg, move with a speed of 14 m/s toward West and East, respectively. If the two cars collide head on and move together after the collision, how much kinetic energy losses from the system of the two cars?
   A. $8.64\ x\ 10^5\ J$ C. $6.94\ x\ 10^5\ J$
   B. $3.36\ x\ 10^5\ J$ D. 0

8. What is the expression for the efficiency (η) of a simple machine in terms of the actual mechanical advantage (MA) and velocity ratio (VR) of the machine?
   A. $\eta = MA/VR$ C. $\eta = VR/MA$
   B. $\eta = MA\ x\ VR$ D. $\eta = MA - VR$

9. What is the magnitude of the pressure a driver submerges 9m below the surface of water would feel? (Take Atmospheric Pressure to be 101 kPa and density of water is 1000 kg/m^3)
   A. 11 kPa
   C. 191 kPa
   B. 10001 kPa
   D. 91.01 kPa

10. A hydraulic machine with two pistons having circular shapes with radii of 4cm and 52cm is used to lift a mass of 2600 kg. Assume that the mass is placed on the piston with larger cross section, what should be the magnitude of the force exerted on the smaller piston to lift the mass?
   A. $153.85\pi\ N$
   C. 153.85 N
   B. $15.38\pi\ N$
   D. 15.38 N

11. Two blocks of the same material A and B having masses m and 2m. respectively, are supplied with equal amount of heat. Then
   A. The temperature of both blocks increases equally
   B. The change of temperature in block A is twice of that of B
   C. The change of temperature in block B is twice of that of A
   D. No temperature change occurs on both blocks

12. A circular plane of aluminum sheet has a cross-sectional area of $400cm^2$ at a temperature of 0℃ ? What is the area of the plate when its temperature raised to 100℃ (take the linear coefficient of explansion of aluminum $a = 2.3\ x\ 10^{-5}\ K^{-1}$)
   A. 400.9 cm^2
   C. 401.8 cm^2
   B. 401.4 cm^2
   D. 398.2 cm^2

@MesobAcademy

13. Which one of the following feature of a wave is correctly described?
    A. Wave length of a wave is distance between successive crest and trough
    B. The amplitude of a wave is the distance between crest and trough
    C. The wave length is the maximum displacement of particles from their equilibrium position
    D. The frequency of a wave is the number of full-waves that passes a given point per time taken

14. Which one of the following statements explains the nature of longitudinal waves?
    A. They are formed when electric and magnetic fields oscillate in perpendicular direction
    B. They comprise a series of crest and troughs
    C. They propagate parallel to the vibration of the medium
    D. They are waves that can travel trough vacuum

15. Which one of the following physical quantities is constant in uniform circular motion?
    A. Speed
    B. Velocity
    C. Acceleration
    D. Force

@MesobAcademy

16. What is the value of acceleration due to gravity at a height of 1000 km from the surface of the Earth?

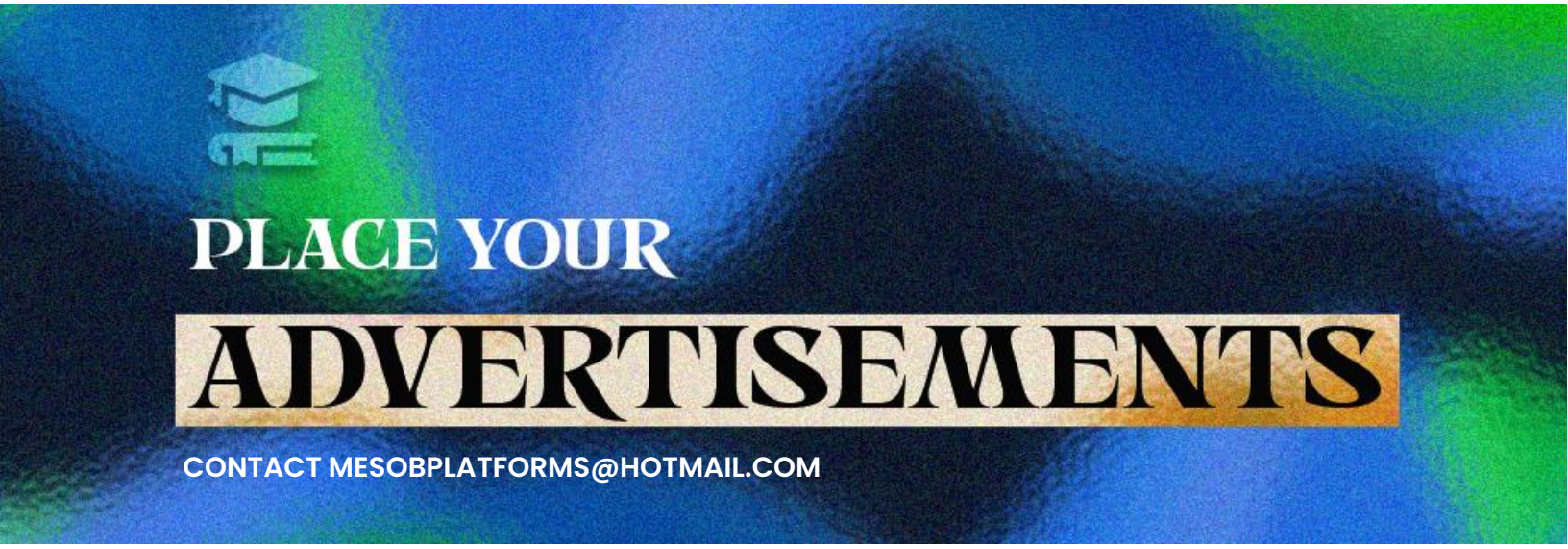
A. 9.80 m/s^2
B. 10.00 m/s^2
C. 9.71m/s^2
D. 7.31m/s^2

17. What is the rotational kinetic energy of a sphere, whose moment of inertia is 14 $kg.m^2$ rotating at an angular velocity of 6 rad/s ?

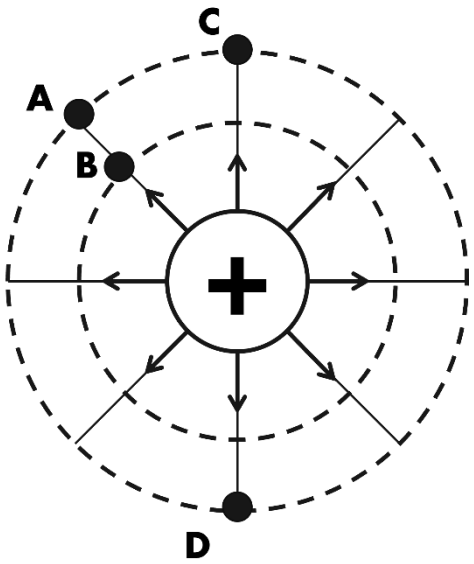
A. 36 J
B. 252 J
C. 504 J
D. 42 J

18. The region in which an electric charge experiences force from another charge is

A. Electric potential
B. Electric field
C. Electric energy
D. Electric force



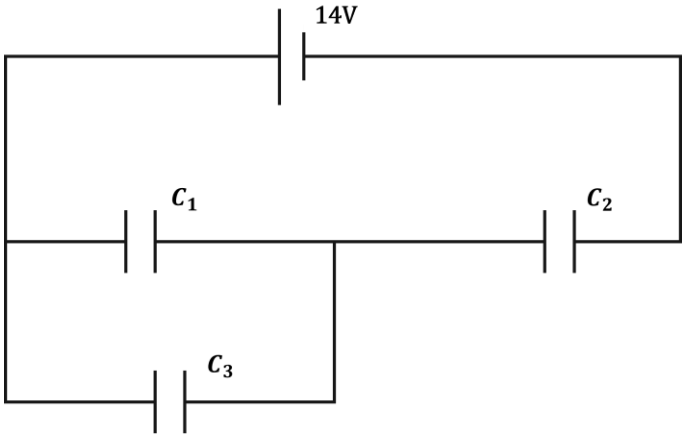
19. The electric field lines of a positive charge are drawn as shown below in the Figure. Two circles were drawn as shown below to compare the magnitude of electric field strength at point A, B, C and D



Which one of the following statements describes correctly the strength of electric field at the points given?

A. C and D have equal electric field strength
B. A and B have equal electric field strength
C. B and C have equal electric field strength
D. B and D have equal electric field strength

20. Three capacitors $C_1 = 1\mu F$, $C_2 = 4\mu F$ and $C_3 = 2\mu F$, are connected to a 14V battery as shown in the figure below



How much total charge will be stored in the capacitors ?

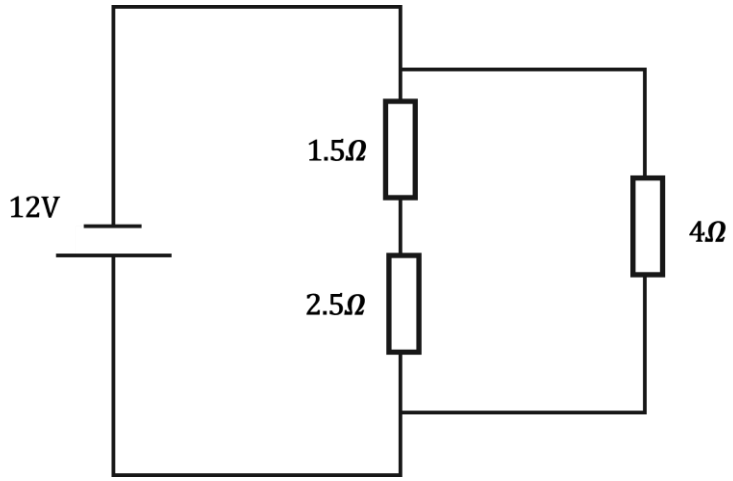
A. 22.12 μC
B. 24.00 μC
C. 1.71 μC
D. 12.00 μC

21. Consider a 10 m long rubber and a 10 m long copper wire with similar cross-sectional area. Which of the following statement explains the relationship between their resistivity and conductivity?

A. Unlike copper, rubber does not have good conductivity due to its low resistivity
B. Unlike rubber, copper is highly conducting due to its high resistivity
C. Since both copper and the rubber have the same length and cross-sectional area, their resistivity is the same.
D. Even though the cross-sectional area of rubber and copper is the same, their conductivity is different.

@MesobAcademy

22. Three resistors of resistances 1.5 Ω, 2.5 Ω *and 4.0 Ω, are connected to a 12V battery as shown in the figure below*



How much current will flow in 4.0Ω resistor?

A. 2 A
C. 1 A
B. 3 A
D. 2.5 A

23. A solenoid with 100 turns of wire has length of 2m and it carries a current of 0.5A. What is the magnitude of the magnetic field at the center of the solenoid ?

A. $2\pi \times 10^{-5}\ T$
C. $\pi \times 10^{-5}\ T$
B. $2\pi \times 10^{-7}\ T$
D. $4\pi \times 10^{-7}\ T$

24. Consider a charge, **q**, moving at a speed of **v** perpendicular to a magnetic field of strength **B**. What will happen to the new magnetic force, **F**, if the speed of the charge is doubled?

A. Half of the original
B. Double of the original
C. Square of the original
D. The same as the original

25. A student wants to build a simple transformer and wrapped two wires on the top half and bottom half of an iron rod. The top wire was connected to an ac voltage supply. Which of the following can occur in the transformer?
    A. Self-inductance of the wire wrapped on top will magnetize the wire in the bottom of the rod.
    B. The top wire will magnetize the iron rod and an alternating current will be induced in the lower wire.
    C. Magnetic field will be induced in the lower wire that will magnetize the iron rod.
    D. The amount of electric current in the lower wire is zero as its biasing voltage is zero.

26. Which one of the following statements is true about the conductivity of a doped silicon semiconductor?
    A. A If silicon is doped with boron, the majority carriers are free electrons.
    B. B If silicon is doped with boron, the majority carriers are holes
    C. C If silicon is doped with Arsenic, the majority carriers are holes.
    D. D If silicon is doped with Arsenic, the number of free electrons and holes are equal.

27. Which one of the following statements is true about a doped semiconductor?
    A. A In an n-type semiconductor, the majority carries are electrons while the minority carriers are holes
    B. B An n-type silicon semiconductor can be produced by doping it with group III elements.
    C. C In n and p-type semiconductors, the concentrations of holes and electrons are the sane.
    D. An arsenic doped silicon semiconductor is a p-type semiconductor.

@MesobAcademy

28. Two mirrors make an angle of 90° with each other. A ray is incident on the horizontal mirror at an angle of 65° to the normal. Find the angle the ray makes with the normal to the vertical mirror after it is reflected from both mirrors

A. 35°
C. 75°
B. 23°
D. 65°

29. An iron bar partially submerged in water appears to be bent, what explains the reason behind this phenomenon ?

A. When the Iron is submerged in water it gets rusted and starts to bend
B. The angle of reflection of light from the iron bar is different in different mediums
C. Since water and air have different indices of refraction, the light from the air gets refracted as it passes through the water
D. As light scattered from the surface of the metal, it will appear that the metal in water is bent.

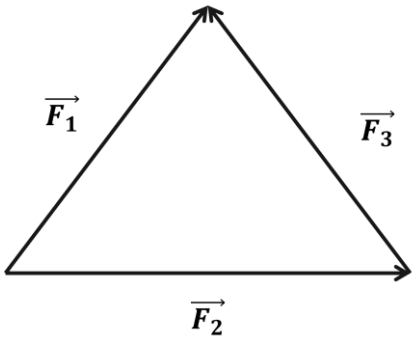
30. Five students walking around their school wanted to check their weights on a balance placed on the side of the road. The reading of the balance and the true weight of students are given in the table shown below

Students	Student 1	Student 2	Student 3	Student 4	Student 5
Measured weights (kg)	48	52	46	50	40
True weights (kg)	46	50	44	48	35

What can you say about the difference between their true weights and their weights measured on the balance? The errors in their weights measured by the balance are

A. Random
B. Both random and systematic
C. Systematic
D. Different for the first and last students

31. Three vectors $\overrightarrow{F_1}, \overrightarrow{F_2}$ and $\overrightarrow{F_3}$ are drawn on a scale as shown in the figure below



Which one of the following equations describes the relationship between the three vectors?

A. $\overrightarrow{F_1} + \overrightarrow{F_2} + \overrightarrow{F_3} = 0$
C. $\overrightarrow{F_1} - \overrightarrow{F_2} + \overrightarrow{F_3} = 0$
B. $-\overrightarrow{F_1} + \overrightarrow{F_2} + \overrightarrow{F_3} = 0$
D. $\overrightarrow{F_1} + \overrightarrow{F_2} - \overrightarrow{F_3} = 0$

32. A rabbit was hopping on a big field toward a carrot pile which was placed at 20m to the positive x-direction and 7m to the negative y-direction from its starting point. Which of the following displacement vector, $\vec{S}$, represents her motion?

A. $\vec{S} = (20i + 7j)m$
C. $\vec{S} = (-20i + 7j)m$
B. $\vec{S} = (7i + 20j)m$
D. $\vec{S} = (20i - 7j)m$

33. Which one of the following statements defines the term reference frame?

A. A physical body on which a coordinate axis fixed to measure the motion of other body
B. A boundary of physical body in which a body moves freely and for bodies to get out from there
C. A coordinate which attached on a body whose motion is observed
D. A coordinate on which all moving bodies at any velocity appear to the stationary

34. A race car starting from rest accelerated at a constant rate of $4m/s^2$. What will be the velocity of the car after travelling a distance of 20 km?
    A. 200 m/s
    B. 400 m/s
    C. -200 m/s
    D. -400 m/s

35. A ball thrown horizontally with a speed of 5m/s from the top of a 20m high building hit the ground after a time t. what will be the horizontal distance from the base of the building to the point it hits the ground? (Neglect air resistance)
    A. 10 m
    B. 50 m
    C. 5 m
    D. 100 m

36. What is the difference between uniform and non-uniform circular motions?
    A. Direction of the acceleration is constant in uniform circular motion but not in non-uniform circular motion.
    B. Speed is constant in uniform circular motion but not in non-uniform circular motion.
    C. The velocity of a body in a uniform circular motion is constant but not in non-uniform motion.
    D. acceleration is zero in uniform circular motion but non-zero constant in non-uniform circular motion.

37. One newton force produces
    A. A velocity on 1 m/s^2 on 1 kg object
    B. A velocity of $1m/s^2$ on 1 kg object
    C. A displacement of $1m/s^2$ on second
    D. A speed of $1m/s^2$ on 1 kg object

38. Impulse (I) of an object of mass, m is defined as the product of the net force(F) exerted on an object during collision and the time of contact (Δt). Using Newton's second law, how will the change in momentum (Δp) and impulse(I) of the object relate?

A. $\Delta p = \frac{I}{\Delta t}$ C. $\frac{\Delta p}{\Delta t} = I$

B. $\Delta p = mI$ D. $\Delta p = I$

39. A car is turning in a circle of radius 25 m on a wet road with coefficient of static friction 0.20. What should be its maximum speed to turn without sliding out of control?

A. $25\sqrt{2}\ m/s$ C. 50 m/s

B. $5\sqrt{2}\ m/s$ D. $50\sqrt{2}\ m/s$

40. A student is asked to carry a box full of 25 grade-10 physics text books each weighing 5 N up a stair of height 20 m. The amount of work done by the student is

A. Equivalent to the energy transferred to the box

B. Higher than the energy transferred to the box

C. Lower than the energy transferred to the box

D. The ratio of the force the student exerted to lift the weight to the height of the stairs

@MesobAcademy

41. A ball is dropped from a building of height h. The kinetic energy of the ball (Neglect air resistance)
    A. is maximum at its maximum height
    B. just before it hits the ground is equal to its potential energy when it is dropped
    C. and the potential energy of the ball are equal when it hits the ground
    D. and the potential energies of the ball cannot be equal any time during the flight

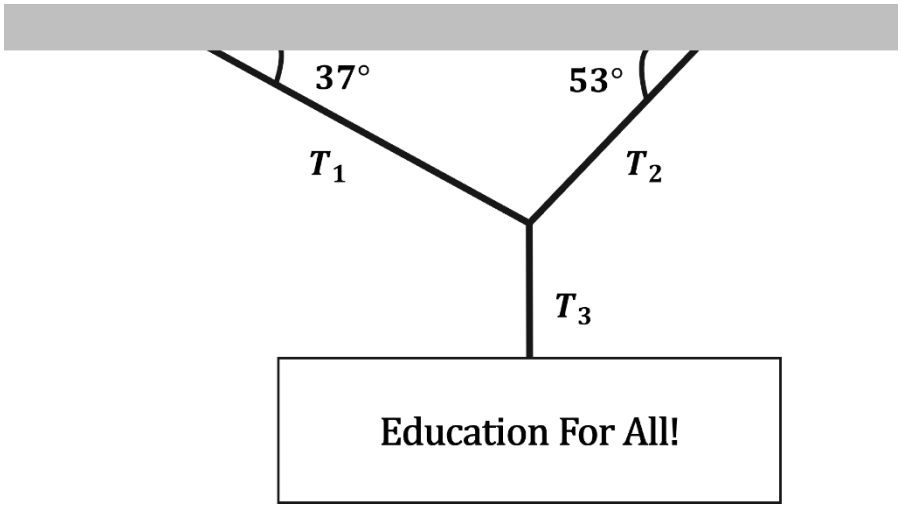
42. An airplane propeller slows from an initial angular speed of 12.5 rev/s to a final angular speed of 5.00 rev/s at a constant angular acceleration. During this process, the propeller rotates through 21.0 revolutions. What is the angular acceleration of the propeller?
    A. $-6.25\pi\ rad/s^2$
    B. $0.36\pi\ rad/s^2$
    C. $-0.36\pi\ rad/s^2$
    D. $-7.44\pi\ rad/s^2$

43. A 10 kg disk of radius 1 m is accelerated by an applied torque of 40 Nm. What is the magnitude of its angular acceleration ? (use $I = {}^1/_2\, MR^2$ for disc)
    A. $4\ rad/s^2$
    B. $5\ rad/s^2$
    C. $8\ rad/s^2$
    D. $0.25\ rad/s^2$

44. The law of conservation of angular momentum states that the angular momentum of a body remains constant provided that
    A. A constant non-zero resultant torque is applied on it
    B. There is no frictional loss
    C. The sum of the forces equals to zero
    D. The resultant torque applied to it is zero

45. The first condition equilibrium states that states an object is in equilibrium provided that
    A. the sum of all forces exerted on an object is zero
    B. the sum of all forces exerted on an object is non-zero.
    C. the sum of all torques exert on the object is zero.
    D. the net torque applied on the object is non-zero constant.

46. A big post weighing 50N is hanging from a vertical cable tied to two other cables that are fastened to a support as shown in the Figure below. The upper cables make angles of 37 and 53 with the horizontal.



Find the tension in each of the three cables

A. $T_1 = 40N, T_2 = 50N, T_3 = 20N$
B. $T_1 = 30N, T_2 = 40N, T_3 = 50N$
C. $T_1 = 40N, T_2 = 50N, T_3 = 30N$
D. $T_1 = 40N, T_2 = 30N, T_3 = 50N$

47. A type of fluid flow where there is disruption to layer fluid in which the velocity of the fluid at any point is continuously changing both in magnitude and direction is rate is changing is

A. Laminar flow
B. Stream line
C. turbulent flow
D. incompressible flow

48. A brass slab of cross-sectional area $8 \times 10^{-4}\ m^2$ and a length of 1.5 m has a temperature difference of 70°C across its length. If the thermal conductivity of brass is 109 W/mk. What is the rate at which heat flows?

A. 2.16 W
B. 0.406 W
C. 4.06 W
D. 21.6 W

49. Which one of the following concepts of physics is not used in mechanical engineering?

A. Aerodynamics
B. Molecular dynamic
C. Thermodynamics
D. Mechanics

50. A student is given an assignment to do a simple survey on the birds that enter a nest on a tree far from his house in a single day. Which one of the following statements is correct about his Survey?

A. He can count the number of red birds entering the nest at night using infra-red camera.
B. He can use binoculars to count the number of birds entering the nest both during the day and at night.
C. He can use binoculars during the day and infra-red cameras at night to determine both the number and colors of the birds entering the nest.
D. He can use binoculars during the day and infra-red cameras at night to count the number of bird but he cannot be sure about their colors.

@MesobAcademy

51. A relief airplane drops packages of wheat to the people in need. The plane was travelling horizontally at 20 m/s at a height of 80 m above the ground. What will be the horizontal and vertical components of the velocity of the package just before it hits the ground? (Neglect air resistance)
    A. $V_x = 0\ m/s$ and $V_y = 4\ m/s$
    B. $V_x = 20\ m/s$ and $V_y = 40\ m/s$
    C. $V_x = 20\ m/s$ and $V_y = 20\ m/s$
    D. $V_x = 20\ m/s$ and $V_y = 80\ m/s$

52. A bead rotating in a circle of radius r, covers a distance of, S while sweeping out an angle of 'θ' in time 't'. The bead's angular velocity is
    A. $\frac{s}{t}$
    B. $\frac{\theta}{t}$
    C. $\frac{r\theta}{t}$
    D. $\frac{r}{t}$

53. Three forces were acting on a particle rotating around a circle at a fixed axis. If the torque by the three forces is doubled, the angular acceleration will be
    A. Halved
    B. Doubled
    C. remains constant
    D. zero

54. What will be the cause of pressure in fluids?
    A. The tangential force acting on the fluid layers
    B. The normal force acting on the fluid layers
    C. Both the tangential and the normal forces acting on the fluid layers
    D. Neither the tangential nor the normal forces acting on the fluid layers

55. An athlete takes his nap on a bed of nails after a long training. How is it possible? Because
    A. he has strong skin.
    B. his weight is distributed over all the nails in the bed reducing the pressure on the athlete.
    C. his weight is distributed over all the nails in the bed increasing the pressure on the athlete.
    D. the nails are not sharp.

56. A hose is pointed straight up, with water flowing from it at a steady volume flow rate and reaching a maximum height of h. Neglecting air resistance, which of the following adjustments to the nozzle will result in the water reaching a height of 4h? Decrease the area of the opening by a factor of
    A. 1/16
    B. 1/8
    C. 1/4
    D. ½

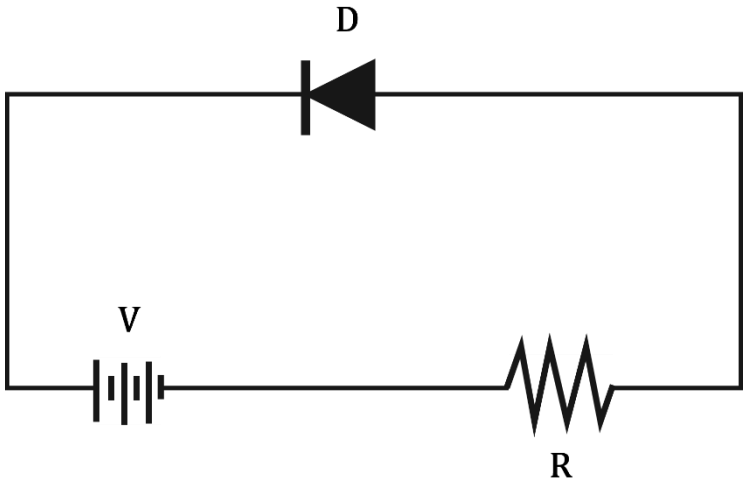
57. A student is building an electromagnet by wrapping a wire around a coil. What is true about the electromagnet?
    A. There will be magnetic field in the electromagnet even though the current flowing through the wire is zero.
    B. The source of the magnetic field in the electromagnet is the earth's magnetic field.
    C. The electromagnet will have magnetic field when there is a current flowing thorough the wire.
    D. The electromagnet will retain its magnetic property when the current is off.

@MesobAcademy

58. A l00 tun coil is wrapped in a square frame of length, 10 cm, with each turn having the area of the frame. The square frame is placed in XY plane, when a magnetic-field that decreases from 0.5 T to 0 T in 0.2s is turned on perpendicular to it. If the resistance of the coil is 2.5Ω , how much electromotive force will be generated?

A. 0.025 V
B. 2.500 V
C. 5.000 V
D. 0.500

59. A student biased a pn-junction diode with a battery as shown in the Figure below.



What will happen when he reverses the terminals of the battery?

A. The width of depletion layer of the diode increases.
B. The amount of current that flows through the diode is almost zero.
C. There will be low resistance to the flow of current.
D. The width of the depletion layer remains the same.

60. A video stored in a CD can be played using a computer. How is the video stored?
    A. The pictures are changed into a continuous signal that corresponds to each color
    B. The pictures are changed into a series of 0s and 1s when they are stored
    C. The pictures are represented as analog signal to represent each …
    D. The pictures are stored as varying sinusoidal signals

The End



MESOB ACADEMY

@mesobacademy

CLICK TO JOIN