

YEKA SUB-CITY EDUCATION OFFICE (YSEO)

ETHIOPIAN UNIVERSITY ENTRANCE MODEL EXAMINATION (EUEME)

PHYSICS, GINBOT 2013/MAY 2021.

TIME ALLOWED: 2 HOURS

GENERAL DIRECTIONS

THIS BOOKLET CONTAINS **PHYSICS** EXAMINATION. IN THIS EXAMINATION, THERE ARE A TOTAL OF **50 MULTIPLE CHOICE EQUATIONS**. CAREFULLY SELECT THE BEST ANSWER AND **BLACKEN** ONLY THE LETTER OF YOUR CHOICE ON THE SEPARATE ANSWER SHEET PROVIDED. FOLLOW THE INSTRUCTION ON THE ANSWER SHEET AND THE EXAMINATION PAPER CAREFULLY. USE ONLY **PENCIL** TO MARK YOUR ANSWERS. YOUR ANSWER MARK SHOULD BE **HEAVY AND DARK**, COVERING THE ANSWER SPACE COMPLETELY. PLEASE ERASE ALL UNNECESSARY MARKS COMPLETELY FROM YOUR ANSWER SHEET.

YOU ARE ALLOWED TO WORK ON THE EXAM FOR **2 HOURS**. WHEN TIME IS CALLED, YOU MUST IMMEDIATELY STOP WORKING, PUT YOUR PENCIL DOWN, AND WAIT FOR FURTHER INSTRUCTIONS.

ANY FORM OF CHEATING OR AN ATTEMPT TO CHEAT IN THE EXAMINATION WILL RESULT IN AN AUTOMATIC DISMISSAL FROM THE EXAMINATION HALL AND CANCELLATION OF YOUR SCORE(S).

PLEASE MAKE SURE THAT YOU HAVE WRITTEN ALL THE REQUIRED INFORMATION ON THE ANSWER SHEET BEFORE YOU START TO WORK ON THE EXAMINATION.

DO NOT TURN THIS PAGE OVER UNTIL YOU ARE TOLD TO DO SO.

Ethiopian University Entrance Model Examination (EUEME)**Physics****Ginbot 2013/May 2021****Time Allowed: 2hours****Number of Items: 50**

DIRECTIONS: Each of the following questions is followed by **four** possible alternatives. Read each question and carefully **blacken** the letter of your best choice on the separate answer sheet provided.

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

Constant	Symbol	Value
Acceleration due to gravity	g	10m/s^2
Permittivity of vacuum	ϵ_0	$8.85 \times 10^{-12} \text{C}^2/\text{N.m}^2$
Charge of an electron	e	$1.6 \times 10^{-19}\text{C}$
Permittivity of free space	μ_0	$4\pi \times 10^{-7} \text{Tm/A}$
Universal gas constant	R	8.31 J/mol. k.
Planck's constant	h	$6.63 \times 10^{-34} \text{J.s}$
Electron mass	M_e	$9.11 \times 10^{-31} \text{kg}$
Proton mass	M_p	$1.67 \times 10^{-27} \text{kg}$
$\ln 2 = 0.693,$ $\pi = 3.14$	p	$1.6 \times 10^{-19}\text{C}$
$\sin 30^\circ = \cos 60^\circ = 0.5,$	$\cos 90^\circ = \sin 0^\circ = 0$	
$\sin 37^\circ = \cos 53^\circ = 0.6,$	$\sin 90^\circ = \cos 0^\circ = 1$	
$\sin 45^\circ = \cos 45^\circ = 0.707$	Speed of light in air, $c = 3 \times 10^8 \text{m/s}$	
$\sin 53^\circ = \cos 37^\circ = 0.8$	$e = 2.71$	
$\sin 60^\circ = \cos 30^\circ = 0.866$		

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- Which of the following is **NOT TRUE** about accuracy of a measurement?
 - Accuracy refers to the closeness of repeatedly measured data to a true value.
 - Accuracy refers to the closeness of repeatedly measured data to each other.
 - Measurements of high precision, more likely to be accurate than those of poor precision.
 - Highly precise measurements are sometimes not accurate.
- From the following, one is FALSE about Uncertainty.
 - Uncertainty is the amount of doubt in a measurement.
 - Uncertainty does not mean that it is wrong.
 - Uncertainty explains the amount of wrong in a measurement.
 - Percentage uncertainty is uncertainty of reading expressed in a percentage.,
- If a particle is moving at a velocity $\vec{u} = 4\text{m/s}$ in the positive x – direction and $\vec{v} = 8\text{m/s}$ at 60° above $\vec{u}$. What is the magnitude of the velocity of the particle?
 - $5\sqrt{7}\text{m/s}$.
 - $3\sqrt{5}\text{m/s}$.
 - $6\sqrt{5}\text{m/s}$.
 - $4\sqrt{7}\text{m/s}$.
- If the scalar projection of $\vec{A}$ on to $\vec{B}$ is 1 and $|\vec{A}|$ and $|\vec{B}|$ are $\sqrt{6}$ and 5 respectively, $\vec{A} \cdot \vec{B}$ is:
 - 5.
 - $\sqrt{6}$.
 - $5\sqrt{6}$.
 - 1.
- Given four vectors $\vec{A} = 2\hat{i} - \hat{j}$, $\vec{B} = 4\hat{i} - 2\hat{j}$, $\vec{C} = \hat{i} - \hat{j}$, and $\vec{D} = 2\hat{i} + 3\hat{j}$, which pair of these vectors are collinear?
 - $\vec{C}$ and $\vec{D}$.
 - $\vec{A}$ and $\vec{B}$.
 - $\vec{B}$ and $\vec{C}$.
 - $\vec{A}$ and $\vec{C}$.
- Which of the following is wrong about motion in a circle?
 - When a body is moving in a horizontal circle, the speed remains constant.
 - When a body is moving in a vertical circle, the speed remains constant.
 - When a body is moving in a horizontal circle, the velocity changes.
 - When a body is moving in a vertical circle, the speed does not remains constant.
- In projectile motion, the maximum range is achieved when the angle of projectile is:
 - 75° .
 - 60° .
 - 45° .
 - 30° .
- A body moves along x-axis in such a way that its distance as a function of time is:
 $\vec{S}(t) = 20 - 8t + 4t^2$. What is the average velocity during the 4th second?
 - 25 m/s.
 - 30 m/s.
 - 15 m/s.
 - 20 m/s.
- A body sets from rest with a constant acceleration of 8m/s^2 . What distances will it have covered after 3 seconds?
 - 36m.
 - 26m.
 - 46m.
 - 30m.

10. Among the following, which one is true about instantaneous acceleration?

- A. Instantaneous acceleration is difference in displacement between two points divided by the time taken to travel between the two points.
- B. Instantaneous acceleration is change in velocity divided by the time taken for the change to happen.
- C. Instantaneous acceleration is acceleration of an object at a point.
- D. Instantaneous acceleration is difference in velocity between two points divided by the time taken to travel between the two points.

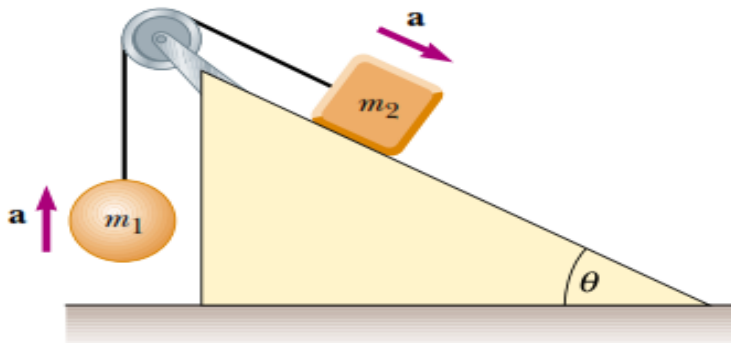
11. A block of mass m_1 and m_2 are attached by a lightweight cord that passes over a frictionless pulley of negligible mass as shown figure below. If the block lies on a frictionless incline of angle, what is the **tension** of the cord?

A. $\frac{M_1 M_2 g (\cos \theta + 1)}{M_1 + M_2}$.

B. $\frac{M_1 M_2 g (\sin \theta + 1)}{M_1 + M_2}$.

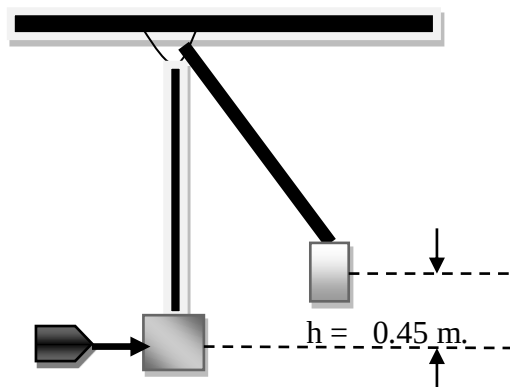
C. $\frac{M_1 M_2 g (\sin \theta - 1)}{M_1 + M_2}$.

D. $\frac{M_1 M_2 g (\cos \theta - 1)}{M_1 + M_2}$.



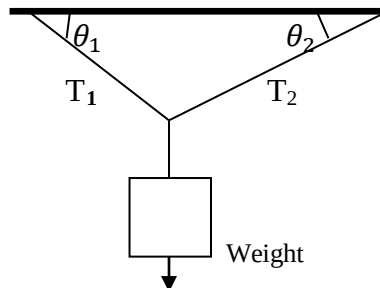
12. A bullet of mass 10 gram, moving horizontally, strikes and embeds itself in a box of mass 1kg suspended from a light string as shown in the figure below. If the composite mass rises to a height $h = 0.45$ m, then what is the speed of the bullet before collision?

- A. 303 m/s.
- B. 300 m/s.
- C. 90.9 m/s.
- D. 90 m/s.



13. Which of the following is **NOT** correct about momentum?
- A. The total linear momentum of an isolated system remains constant.
 - B. Impulse is the change in momentum.
 - C. Impulse and momentum have the same unit.
 - D. Linear momentum is mass multiplied by impulse.
14. Which one of the following statements is **NOT TRUE** about the dynamics of uniform circular motion?
- A. The maximum velocity of a vehicle going round a bend increased by banking the surface.
 - B. The radial force on a body is constant when the body is in uniform horizontal motion.
 - C. The radial force on a body varies when the body moves uniformly in a vertical circle.
 - D. The radial force on a body varies when the body is in uniform horizontal motion.
15. Which statement is correct about conservative and dissipative forces?
- A. The work done by conservative forces is path dependent.
 - B. A dissipative force causes mechanical energy to be lost from a body when it is moving.
 - C. Gravitational force is an example of dissipative force.
 - D. Friction is an example of conservative force.
16. A particle moves in a circular path of radius r with speed v . When the speed of the particle is decreased by halved at travelling along the same circular path, the centripetal acceleration is:
- A. Halved.
 - B. doubled.
 - C. quadrupled.
 - D. quartered.
17. Which of the following is correct about the total kinetic energy of the whole fly wheel?
- A. The total kinetic energy of the whole fly wheel is the sum of that every particles in it and those particles have the same speed.
 - B. The total kinetic energy of the whole fly wheel is the sum of that every particles in it and those particles have different angular speed.
 - C. The total kinetic energy of the whole fly wheel is the sum of that every particles in it and those particles have the same angular speed.
 - D. The total kinetic energy of the whole fly wheel is the sum of that every particles in it and those particles have the same speed and angular speed.
18. A crane raises 75 Kg bricks from the ground to a height of 45m in 52 sec. a constant speed. The average power of the crane is:
- A. 649 W.
 - B. 14.4 W.
 - C. 3,375W.
 - D. 144W.

19. A wheel rotates with a constant angular acceleration of 3.5 rad/s^2 . If the angular speed of the wheel is 2 rad/s at $t = 0$, through what angular displacement does the wheel rotate in 2 sec.
- A. 18 rad. B. 9.5 rad. C. 11 rad. D. 7.5 rad.
20. An object of mass 1 kg moving with a speed of 2 m/s was acted on by a force that produces an acceleration of 2 m/s^2 . What is the change in kinetic energy of the object if the force is exerted on the object for 2 seconds in its direction of motion?
- A. 1 J. B. 4 J. C. 8 J. D. 16 J.
21. The point at which all of the mass of a body can be considered to be concentrated when analyzing the motion of a body is:
- A. Torque. B. Inertia. C. Center of mass. D. Impulse.
22. Identify the correct statement about condition of equilibrium.
- A. Static equilibrium that occurs when a body is moving at steady velocity and there is no net force or net force or net torque acting on it.
- B. Dynamic equilibrium that occurs when a body is at rest and there is no net force or net force or net torque acting on it.
- C. Dynamic equilibrium that occurs when a body is moving at steady velocity and there is no net force or net force or net torque acting on it.
- D. In rotational equilibrium, the sum of all external torques acting on the body is non-zero.
23. Which of the following is NOT TRUE about couples?
- A. A couple is a set force with a resultant moment but no net force.
- B. A couple is a set force with a resultant moment and net force.
- C. The torque of a couple is the force multiplied by the distance between the force.
- D. The linear resultant of a couple is zero.
24. An object of mass 3 kg hangs from three light inextensible wires as shown in figure below. Two of the wires make angles $\theta_1 = 53^\circ$ and $\theta_2 = 37^\circ$ with the horizontal. If the system is in equilibrium, what will be the tensions T_1 and T_2 in the wires?
- A. $T_1 = 18\text{N}$ and $T_2 = 24\text{N}$.
- B. $T_1 = T_2 = 18\text{N}$.
- C. $T_1 = T_2 = 24\text{N}$.
- D. $T_1 = 24\text{N}$ and $T_2 = 18\text{N}$.



25. A material rod that is 4m long and 0.5cm^2 in cross – sectional area is found to stretch 0.2cm under a tension of 5000N. The Young's Modulus for this material is:

- A. $1 \times 10^8 \text{ N/m}^2$.
B. $5 \times 10^8 \text{ N/m}^2$.
C. $1 \times 10^4 \text{ N/m}^2$.
D. $2 \times 10^{11} \text{ N/m}^2$.

26. The continuity equation is based on the principle of conservation of:

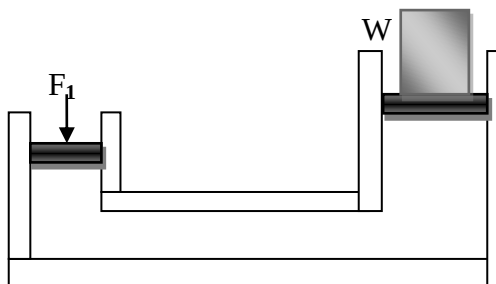
- A. Energy. B. momentum. C. Mass. D. Kinetic energy.

27. When forces that caused deformation are removed, body goes back to its original dimensions. Such type of deformation is:

- A. Elastic deformation. C. Elasticity.
B. Plastic deformation. D. Elastic Limit.

28. The cross- sectional areas of the small and large pistons of a hydraulic lift shown in figure below are 4 cm^2 and 0.02 m^2 , respectively. What is the magnitude of the force F_1 that must be applied to the small piston to lift a weight $w = 15,000 \text{ N}$ placed on the larger piston?

- A. $3.0 \times 10^2 \text{ N}$.
B. $1.5 \times 10^4 \text{ N}$.
C. $7.5 \times 10^5 \text{ N}$.
D. $3.0 \times 10^6 \text{ N}$.

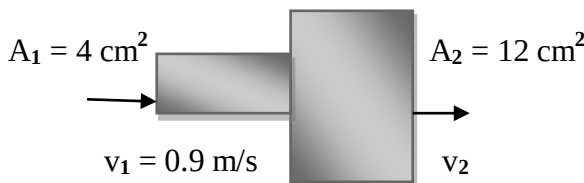


29. The amount of energy released or absorbed by a substances during a change of state that occurs without change in temperature is:-

- A. Specific heat capacity. C. Heat capacity.
B. Latent heat. D. Change of state.

30. In the figure below, what is the speed of water as it leaves A_2 ?

- A. 0.3 m/s.
B. 0.9 m/s.
C. 3.3 m/s.
D. 3.6 m/s.

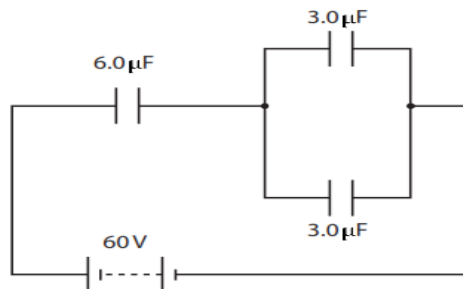


31. Two moles of an ideal gas at a temperature of 308 K is confined in a volume of $5 \times 10^{-3} \text{ m}^3$. The pressure of the gas is:

- A. $1.23 \times 10^6 \text{ Pa}$.
B. $5.12 \times 10^6 \text{ Pa}$.
C. $1.02 \times 10^6 \text{ Pa}$.
D. $1.00 \times 10^6 \text{ Pa}$.

32. Among the following which one is **correct** about the assumptions made in the kinetic theory of gases?
- A. Collision between particles and between particles and walls are inelastic.
 - B. The volume occupied by the particle is negligible compared to the volume of the gas as a whole.
 - C. The distribution of velocities of particles is uniform.
 - D. There is an interaction b/n particles or between particles and wall during collision.
33. In an Isothermal process:
- A. Internal energy of the gas increases.
 - B. Internal energy of the gas remains constant.
 - C. Average kinetic energy of the gas decreases.
 - D. Internal energy of the gas decrease.
34. A gas at atmospheric pressure is suddenly compressed adiabatically to one-fourth of its original volume. If $(\gamma = \frac{3}{2})$, then what is the final pressure?
- A. 8 atm. B. 0.75 atm. C. 0.25 atm. D. 4 atm.
35. Which of the following is **correct** statement of second law of thermodynamics?
- A. There is a process in which an overall decrease in the entropy of the universe.
 - B. The complete conversion of energy from a hot source in to work is not possible.
 - C. The spontaneous transfer of energy from a cooler body to a hotter body is possible.
 - D. The complete conversion of energy from a hot source in to work is possible.
36. The total energy of particle executing Simple Harmonic Motion is:
- A. Directly proportional to the amplitude of the oscillation.
 - B. Directly proportional to the angular frequency of the oscillation.
 - C. Directly proportional to the square of angular frequency of the oscillation.
 - D. Inversely proportional to the amplitude of the oscillation.
37. A standing pattern is observed in a thin wire of length 2 meter. If the equation of the wave is $x = 20\text{m} \sin(\pi x) \cos(4\pi t)$, where x is in meter and t is in seconds. Then what is the wave length of the pattern?
- A. 4m. B. 3m. C. 5m. D. 2m.
38. What fundamental frequency can a string vibrate at if it is 30cm long and the velocity of travelling waves along the string is 120m/s?
- A. 400Hz. B. 600Hz. C. 800Hz. D. 200Hz.

39. Which of the following statement is **correct** about wave?
- A. Sound wave is an example of transverse wave.
 - B. In transvers wave, the vibration of the particles of the medium is parallel to the motion of the wave.
 - C. Radio wave is an example of sound wave.
 - D. In longitudinal wave, the vibration of the particles of the medium is parallel to the motion of the wave.
40. Which one of the following is correct statement about the intensity of sound?
- A. It is inversely proportional to the square of the distance from the source of sound.
 - B. It is directly proportional to the square of the distance from the source of sound.
 - C. It is energy transmitted per unit time.
 - D. It is the product of power of the sound and area through which the sound is transmitted.
41. Identify the correct statement about interference of light?
- A. Destructive interference increase in intensity that is dark regions called maxima.
 - B. Constructive interference decrease in intensity that is dark regions called minima.
 - C. Destructive interference increase in intensity that is brighter regions called maxima.
 - D. Constructive interference increase in intensity that is brighter regions called maxima.
42. For two waves to be coherent they must be:
- A. Maintain constant phase relationship.
 - B. Maintain varies phase relationship.
 - C. Have different frequency.
 - D. The different type of wave.
43. Which of the following quantity is remains unchanged when the light travels from one medium to another?
- A. Its frequency.
 - B. Its speed.
 - C. Its wavelength.
 - D. Its wave number.
44. Three capacitors $C_1 = 6\mu\text{F}$, $C_2 = 3\mu\text{F}$ and $C_3 = 3\mu\text{F}$ are connected across a battery as shown figure below. The potential differences across capacitors C_1 , C_2 , and C_3 respectively?
- A. 60 V, 30 V, 30V.
 - B. 30 V, 60 V, 30 V.
 - C. 30 V, 30 V, 30 V.
 - D. 60 V, 60 V, 60 V.



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45. If the distance between two point charges is halved, what will happen to the force of interaction between the charges?
- A. The force will be doubled. C. The force will be reduced by a factor of $\frac{1}{4}$.
B. The force will be reduced by half. D. The force will be increased by a factor of 4.
46. What is the potential (V) at a distance of 9cm from charge of $6\mu\text{C}$?
- A. 60 Kv. B. 600kv. C. 30kv. 300kv.
47. When a potential difference of 20V is applied to parallel plate capacitor that have 4cm^2 cross-sectional area, separated at 8.85cm from each other's after dielectric constant ($\epsilon_r = 2$) inserted. What is the total energy that can be stored by the plate of the capacitor?
- A. $4 \times 10^{-16}\text{J}$. B. $8 \times 10^{-14}\text{J}$. C. $16 \times 10^{-12}\text{J}$. D. $12 \times 10^{-14}\text{J}$.
48. A particle of mass $2 \times 10^{-4}\text{ kg}$ and $8 \times 10^{-6}\text{ C}$ of charge is released in a region where there is a constant electric field of 250 N/C. What is the acceleration of the electric field?
- A. 10m/s^2 . B. 5m/s^2 . C. 15m/s^2 . D. 20m/s^2 .
49. A circuit with source e.m.f. is 16V and internal resistance of 2Ω is connected to a 6Ω external load to form a closed circuit. So, the terminal potential difference is:
- A. 2V. B. 12V. C. 18V. D. 24V.
50. According to Kirchhoff's junction rule:
- A. The current flowing in to a point is greater than to the current flowing out of that current.
B. The current flowing in to a point is less than to the current flowing out of that current.
C. The current flowing in to a point is equal to the current flowing out of that current.
D. The voltage flowing in to a point is equal to the voltage flowing out of that current.

THE END