

YEKA SUB-CITY EDUCATION OFFICE (YSEO)
ETHIOPIAN UNIVERSITY ENTRANCE MODEL EXAMINATION (EUEME)
PHYSICS, NEHASIE 2012/AUGUST 2020.

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 MARK 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.

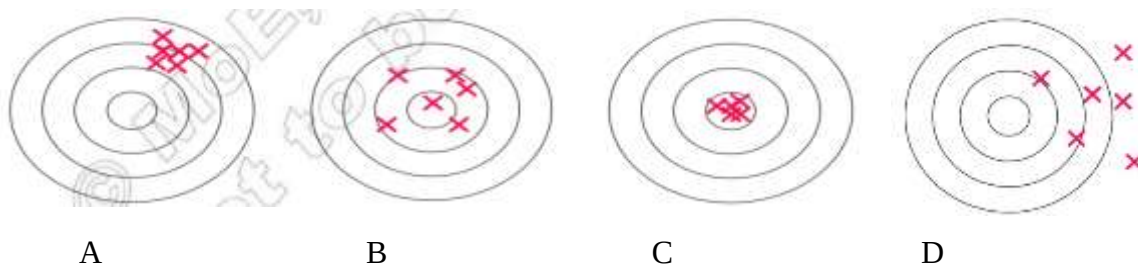
Ethiopian University Entrance Model Examination (EUEME)**Physics****Nehasie 2012/August 2020****Time Allowed: 2hours****Number of Items: 50**

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, $c = 3 \times 10^8 \text{m/s}$	
$\sin 53^\circ = \cos 37^\circ = 0.8$	$e = 2.7$	
$\sin 60^\circ = \cos 30^\circ = 0.866$		

- Which one of the following is **NOT** among the common step in scientific method?
A. Use existing knowledge. C. Form hypothesis.
B. Making measurement. D. Analyses experimental data.
- From the figures given below, which one of them shows accurate but imprecise measurement?



- When $|\vec{A}| = 3$, $|\vec{B}| = 6$ and the angle between $\vec{A}$ and $\vec{B}$ is 60° , what is $|\vec{A} \cdot \vec{B}|$
A. 18. B. 8. C. 9. D. 3.
- Graphically a vector is represented by a ray. The length of the ray represents:
A. The initial point of vectors. C. Analytical type of vectors.
B. The direction of vectors. D. The magnitude of the vectors.
- When a vector is multiplied by a positive scalar:
A. The magnitude of a vector changes, but its direction remains the same.
B. Both magnitude and direction of a vector changes.
C. The magnitude of a vector remains the same, but its direction changes.
D. Both magnitude and direction of a vector remains the same.
- A racing car accelerates uniformly to 35 m/s in 30 sec starting from rest. How far does it travel during this time?
A. 1050m. B. 750m. C. 625m. D. 525m.
- The slope of the velocity- time graph of a uniform accelerated motion is:
A. Displacement. B. Speed. C. Position. D. Acceleration.
- The motion of a particle along x-axis is given by $x(t) = 4 - 9t + 2t^3$ x in meter, t in second. What is the acceleration of a particle at $t=3\text{sec}$.?
A. 45m/s^2 . B. 36m/s^2 . C. 25m/s^2 D. 60m/s^2 .
- A 1500kg car is moving along a horizontal level starting from rest. What work must be done to come up the car's speed of 30m/s in 10 sec?
A. 675KJ. B. 775KJ. C. 575KJ. D. 875KJ.

10. A police car, which was initially at rest, starts chasing after a criminal motorist who passes by. The motorist travels at a uniform speed of 60m/s. If the police car accelerates uniformly at 6m/s^2 , **when** and **where** does it catch the motorist?

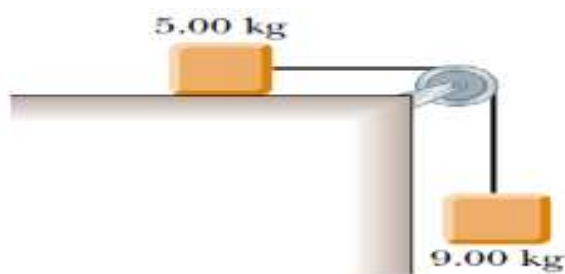
- A. (t = 20sec and S = 1200m).
B. (t = 10sec and S = 1300m).
C. (t = 30sec and S = 1200m).
D. (t = 20sec and S = 1500m).

11. **“A body will continue in its state of rest or uniform motion unless a force acts on it.”**

This statement is the statement of:

- A. Newton’s second law of motion.
B. Newton’s third law of motion.
C. Newton’s law of acceleration.
D. Newton’s first law of motion.

12. A 5kg object placed on a frictionless horizontal table is connected to a string that passes over a pulley and then is fastened to a hanging 9kg object as shown figure below. What is the tension in the string? A. 54.3 N. B. 64.3N. C. 63.4 N. D. 53.4N.



13. Which one of the following is correct statement about collision?

- A. Head on collision is a collision in two dimensions.
B. Glancing collision is a collision one dimension.
C. Elastic collision is a collision in which only kinetic energy is conserved.
D. In elastic collision is a collision in which only momentum is conserved.

14. What is the necessary and sufficient condition for conservation of linear momentum?

- A. The presence of more linear than nonlinear forces in the system.
B. The presence of only non-linear forces.
C. Net force on the system is zero.
D. Internal forces exceed external forces.

15. A force applied on an object varies with the displacement according to the equation $F=(5x+6)\text{N}$. What the total work done in displacing the object 4m on the x- axis starting from the origin?

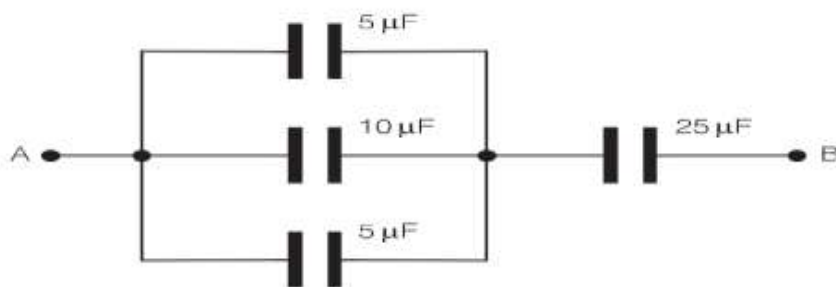
- A. 64J. B. 26J. C. 16J. D. 36J.

16. A car is moving at 144km/hr, if the wheels are 20cm in diameter. What is the angular velocity of the wheel about its axis?
- A. 72 rad/s. B. 200 rad/s. C. 164 rad/s. D. 20 rad/s.
17. Which of the following CORRECT about moment of inertia?
- A. The moment of inertia is depending on the shape of the object.
B. The moment of inertia is depending on the mass distribution of the object.
C. The moment of inertia is depending on size of the body which axis is being considered.
D. The moment of inertia is independent on the shape of the object.
18. A body of mass 2kg has a moment of inertia about its center of mass of 20kgm^2 . It is then rotated about an axis which has a displacement of $\begin{bmatrix} 2 \\ 3 \end{bmatrix}\text{m}$. What is the moment of inertia of the body about this axis?
- A. 26kgm^2 . B. 36kgm^2 . C. 46kgm^2 . D. 20kgm^2 .
19. Which of the following is NOT true about couple?
- A. The linear resultant of a couple is zero.
B. The torque of a couple is the force multiplied by the distance between the forces.
C. A couple is a set of forces with a resultant moment with a given net forces.
D. A couple is a set of forces with a resultant moment but no net forces.
20. The following is correct about equilibrium.
- A. Static equilibrium is an equilibrium that occurs when a body is at rest and there is no net force or net torque acting on it.
B. Static equilibrium is an equilibrium that occurs when a body is moving at steady velocity and there is no net force or net torque acting on it.
C. Dynamic equilibrium is an equilibrium that occurs when a body is at rest and there is no net force or net torque acting on it.
D. Dynamic equilibrium is an equilibrium that occurs when a body is at rest and with acting net force or net torque acting on it.
21. Which of the following statements is correct about the first condition of equilibrium?
- A. The net force on an object must be zero.
B. The sum of all torques must be zero.
C. Clockwise moments should balance counter clockwise moments.
D. The torque produced by a force should be perpendicular to the force.

22. Which one of the following statements is correct?
- A. Elastic materials retain their shape after deformation.
 - B. Plastic materials can recover the original size or shape after being distorted.
 - C. Plastic materials change their shape by pressure.
 - D. Elastic materials cannot recover the original size or shape after being distorted.
23. Which of the following is **TRUE** about molecular forces?
- A. The force of attraction between molecules of the same substances is adhesive force.
 - B. The force of attraction between molecules of the same substances is cohesive force.
 - C. The force of attraction between molecules of different substances is surface energy.
 - D. The force of attraction between molecules of different substances is cohesive force.
24. How much heat energy is required to melt 2kg of ice at 0°C completely to water at 0°C ?
(Use $L_f = 3.36 \times 10^5 \text{J/kg}$).
- A. $67.2 \times 10^5 \text{J}$. B. $6.2 \times 10^5 \text{J}$. C. $6.72 \times 10^5 \text{J}$. D. $7.2 \times 10^5 \text{J}$.
25. A type of fluid where there is disruption to layers of fluid is:
- A. Viscosity
 - B. Laminar flow.
 - C. Streamline flow
 - D. Turbulent flow.
26. Which of the following is correct if the process is adiabatically?
- A. If the work is done by the system, the internal energy of the system is increased.
 - B. If the work is done on the system, the internal energy of the system is decreased.
 - C. If the work is done by the system, the heat energy of the system is increased.
 - D. If the work is done on the system, the internal energy of the system is increased.
27. The second law of thermodynamics does **NOT** imply that:
- A. There is no any process in which there is an overall decrease in the entropy of the universe.
 - B. The complete conversion of energy from a hot source into work is not possible.
 - C. Heat flows from colder body to hotter body as in the refrigerator without work done on the system.
 - D. Perfect reversible processes are impossible.
28. If 60J of work is done on the gas and the internal energy of the system is 100J, how amount of heat is added to the gas?
- A. 160J. B. -160J. C. 40J. D. -40J.

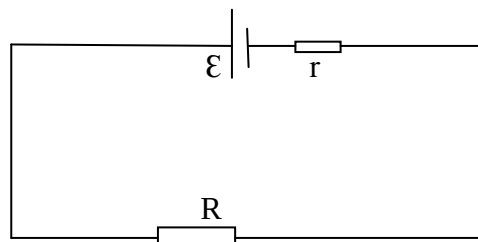
29. The first law of thermodynamics is concerned with conservation of:
- A. Momentum. B. Energy. C. Mass. D. Temperature.
30. An object of mass m is hung from a spring and set in to oscillation. The frequency of the oscillation is measured and recorded as f . If the object of mass m is replaced by an object of four times the mass m and set in to oscillation, what will be the new frequency of the motion?
- A. f . B. $2f$. C. $\frac{2}{f}$. D. $\frac{f}{2}$.
31. For a mechanical wave travelling along a string the speed of the wave **does not** depends on:
- A. The linear density C. The tension of the string.
B. The mass per unit length. D. All of the above
32. What third harmonic frequency can an open-open boundary a string vibrate at if it is 30cm long and the velocity of travelling wave along the string is 120m/s?
- A. 600Hz. B. 400Hz. C. 300Hz. D. 480Hz.
33. Which of the following is **CORRECT** statement?
- A. Minima an areas where constructive interference of light results in a drop in intensity.
B. Maxima an areas where destructive interference of light results in a drop in intensity.
C. Minima an areas where destructive interference of light results in a drop in intensity.
D. Maxima an areas where constructive interference of light results in a drop in intensity.
34. In Young's double slit experiment, if the slit separation is 1.2 mm and the average spacing of the bright fringes observed on a screen placed 4 m away from the source is 2 mm. What is the wavelength of the light source?
- A. 550 nm. B. 600 nm. C. 630 nm. D. 750 nm.
35. Among the following one is the consequences of Gauss's law.
- A. The electric field at the surface of the conductor is parallel to the surface.
B. The electric field outside the conductor is zero.
C. The net electric charge of a conductor resides entirely on its surface.
D. The electric field inside the conductor is different from zero.
36. The capacitance of capacitors can be increased by:
- A. Decreasing plate area.
B. Increase plate separation.
C. Remove the dielectric material from the plates.
D. Introducing the dielectric between the plates.

37. What is the capacitance between points A and B in the figure below?



- A. $45\ \mu\text{F}$. B. $0.54\ \mu\text{F}$. C. $17.15\ \mu\text{F}$. D. $11.11\ \mu\text{F}$.
38. A $10\ \mu\text{F}$ capacitor has an initial charge of $54\ \mu\text{C}$. It is connected to a $25\ \text{M}\Omega$ resistor and allowed to discharge through the resistor. What is the potential difference at $t = RC$?
- A. 2V. B. 0.2V. C. 3V. D. 0.3V.
39. A circuit with source emf is 24V and internal resistance of $0.5\ \Omega$ is connected to $5.5\ \Omega$ external load to form a closed circuit. Then, what is the current in the circuit?
- A. 3 A. B. 4 A. C. 5 A. D. 2A.
40. Which of the following is **NOT** correct about the circuit shown below?

- A. Voltage across R is $\frac{R}{r+R} \mathcal{E}$.
- B. Current flowing through R is $\frac{\mathcal{E}}{r+R}$.
- C. Current flowing through r is $\frac{r}{r+R} \mathcal{E}$.
- D. Power drops in R is $\frac{R}{(r+R)^2} \mathcal{E}^2$

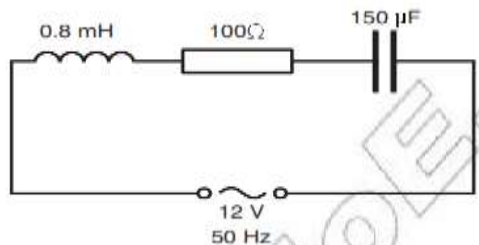


41. A wire 4mm diameter transfers a charge of 900C in 1.5 minute. If there are 3.98×10^{28} free electrons per cubic meter, what is its drift velocity?
- A. $12.5 \times 10^{-4}\ \text{m/s}$. C. $1.25 \times 10^{-4}\ \text{m/s}$.
 B. $12.5 \times 10^{-5}\ \text{m/s}$. D. $1.25 \times 10^{-5}\ \text{m/s}$.
42. A long straight conductor carries a current of 10A. At what distance from the conductor is the magnetic field produced by the current equal to 0.05mT?
- A. 0.4cm. B. 40cm. C. 4cm. D. 0.04cm.
43. Two long wires of 10 m in length carry a current of 2 A and 0.5A in the same direction. The wires are separated by 4 cm. What is the magnetic force that the wires exert on each other?
- A. $5 \times 10^{-5}\ \text{N}$. C. $5 \times 10^{-7}\ \text{N}$.
 B. $5 \times 10^{-6}\ \text{N}$. D. $4 \times 10^{-6}\ \text{N}$.

44. Which one of the following is NOT TRUE concerning magnetic field?

- A. A magnetic field is a region where a magnet exerts a force.
- B. A magnetic field has magnitude with no direction.
- C. The strength of magnetic field is indicated by the quantity of flux the given area.
- D. The stronger the magnetic field, the closer the flux lines.

45. Find the impedance for the RLC circuit shown in the figure below. Ω



- A. 10.22Ω .
 - B. 1.022Ω .
 - C. 1022Ω .
 - D. 102.2Ω .
46. A rectangular coil with an area of 0.06 m^2 has 50 turns and its rotating with an angular speed of 60 rad/s in a magnetic field of 40 mT . What is the maximum emf produced in this coil?
- A. 9.2 V .
 - B. 8.2 V .
 - C. 6.2 V .
 - D. 7.2 V .
47. Which of the following is **TRUE** about power in RLC circuit?
- A. In a simple resistive ac circuit only ideal power is transferred.
 - B. In a simple resistive ac circuit only apparent power is transferred.
 - C. In a capacitive ac circuit only real power is transferred.
 - D. In a simple resistive ac circuit only real power is transferred.
48. Which of the following is the factor that determines magnitude of self & mutual inductance?
- A. Magnetic energy density.
 - B. Current through the coil.
 - C. Area of the coil.
 - D. All of them.
49. The activity of radioactive substance reduces from 2000 Bq to 1000 Bq in 10^6 seconds. What is the decay constant?
- A. $6.93 \times 10^5 \text{ decay/s}$.
 - B. $6.93 \times 10^{-7} \text{ decay/s}$.
 - C. $2 \times 10^6 \text{ decay/s}$.
 - D. $5 \times 10^{-7} \text{ decay/s}$.
50. the minimum energy that necessary to eject an electron from a metal surface is:
- A. Work function.
 - B. Binding energy.
 - C. Photon.
 - D. Photoelectrons.

THE END