

**ADDIS KETEMA SUB-CITY EDUCATION OFFICE
ETHIOPIAN UNIVERSITY ENTRANCE MODEL EXAMINATION
GINBOT 2016/MAY 20224.**

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.

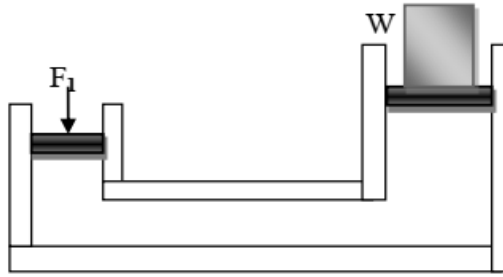
DO NOT TURN THIS PAGE OVER UNTIL YOU ARE TOLD TO DO SO.

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.

Name of constant	Symbol	Value
Acceleration due to gravity	g	10m/s^2
Charge of electron	e	$1.6 \times 10^{-19} \text{ C}$
Universal gravitational constant	G	$6.67 \times 10^{-11} \text{Nm}^2/\text{kg}^2$
Density of water	ρ	1000 kg/m^3
Mass of proton	m_p	$1.67 \times 10^{-27} \text{ kg}$
Mass of electron	m_e	$9.1 \times 10^{-31} \text{ kg}$
Coulomb's constant	C	$9 \times 10^9 \text{ N m}^2 / \text{C}^2$
Mass of the Earth	M_E	$6 \times 10^{24} \text{ kg}$
Radius of the Earth	R_E	$6.4 \times 10^6 \text{ m}$
$\sin 30^\circ = \cos 60^\circ = 0.5$ $\sin 60^\circ = \cos 30^\circ = 0.87$ $\sin 37^\circ = \cos 53^\circ = 0.6$ $\sin 53^\circ = \cos 37^\circ = 0.8$		

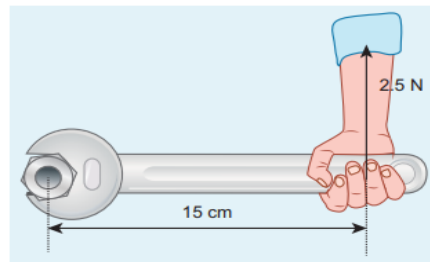
1. How can a vector A be decomposed into its components in a 2-dimensional Cartesian coordinate system?
 - A. By finding the product of its magnitude and direction.
 - B. By determining the projection of A along the x-axis and y-axis.
 - C. By measuring the distance from the origin to the head of the vector.
 - D. By calculating the average of its x and y coordinates.
2. A car accelerates uniformly from rest. Which of the following correctly describes its velocity –time graph?
 - A horizontal line
 - B. Straight line with a positive slope.
 - C. Straight line with a negative slope.
 - D. A parabolic curve.
3. What type of force acts between electrically charged particle?
 - A. Weak nuclear force
 - B. Gravitational force
 - C. Strong nuclear force.
 - D. Electromagnetic force.
4. Which statement best summarizes the role of friction in everyday life?
 - A. Friction always acts to speed up motion between surfaces.
 - B. Friction only acts when there is no motion between surfaces.
 - C. Friction is negligible and has little impact on every day activities.
 - D. Friction opposes the relative motion between surfaces, playing a crucial role in activities like walking, driving, and gripping objects.
5. A car with a mass of 1000kg accelerates from rest to speed of 20 m/s .What is the work done on the car?
 - A. 200,000J
 - B. 400,000J
 - C. 100,000J
 - D. 50,000J
6. A force of 200N is applied to drag a box of 400N on an inclined plane of height 2m. If the inclined plane is 10meters long, what is the efficiency of the inclined plane?
 - A. 20%
 - B. 50%
 - C. 40%
 - D. 25%
7. 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. $7.5 \times 10^5 \text{ N}$
 - C. $1.5 \times 10^4 \text{ N}$.
 - D. $3.0 \times 10^6 \text{ N}$



8. Explain why bridges are built with expansion joints.
 - A. To allow the bridge to expand and contract due to change in temperature.
 - B. To prevent the bridge from expanding or contracting.
 - C. To increase the strength of the bridge.
 - D. To reduce the weight of the bridge.
9. Which property of a wave determines its loudness in sound waves?
 - A. Amplitude
 - B. Frequency
 - C. Wave length
 - D. Velocity
10. What happens to the wave length of a wave if its frequency increases while the speed remains constant?
 - A. The wavelength increases
 - B. The wave length decreases
 - C. The wave length remain the same.
 - D. The wave length becomes zero.
11. A disc initially at rest is subjected to an angular acceleration of 5rad/s^2 . Through what angle does the disc rotate in the first 6 seconds?
 - A. 90 rad
 - B. 45 rad
 - C. 135 rad
 - D. 180 rad
12. What does Newton's law of universal gravitation state?
 - A. The force between two masses is directly proportional to the square of the distance between their centers and inversely proportional to the product of their masses.
 - B. The force between two masses is directly proportional to the product of their masses and inversely proportional to the square of the distance between their centers.
 - C. The force between two masses is directly proportional to the distance between their centers and inversely proportional to the square of the product of their masses.
 - D. The force between two masses is directly proportional to the square of the product of their masses and inversely proportional to the distance between their centers.
13. If a positive charge is moved in the direction of the electric field, how does its electric potential change?
 - A. Increases
 - B. Decreases
 - C. Remains constant
 - D. Becomes zero
14. What happens to the energy stored in a capacitor if the voltage across it is doubled?
 - A. It doubles
 - B. It quadruples
 - C. It halves
 - D. It remains the same
15. If two filament lamps of 3.5Ω and 5.4Ω are in parallel to each other connected with a battery of 12V. Assume each filament has an internal resistance 0.5Ω and 0.6Ω respectively. What is the power dissipated on 3.5Ω ?
 - A. 31.5 W
 - B. 36 W
 - C. 42 W
 - D. 126 W

16. A current- carrying wire produces a magnetic field around it. What happens to the strength of the magnetic field if the current through the wire is doubled?
A. It is halved B. It doubles C. It quadruples D. It remains the same
17. What is Faraday's law of electromagnetic induction?
A. The induced electromotive force in any closed circuit is equal to the rate of change of the magnetic flux through the circuit.
B. The induced magnetic field in any closed circuit is equal to the rate of change of the electric flux through the circuit.
C. The induced electromotive force in any closed circuit is inversely proportional to the rate of change of the magnetic flux through the circuit.
D. The induced magnetic field in any closed circuit is directly proportional to the rate of change of the electric flux through the circuit.
18. How does doping affect the energy band gap of a semiconductor?
A. It significantly increases the band gap
B. It significantly decreases the band gap
C. It introduces discrete energy levels within the band gap.
D. It has no effect on the band gap.
19. How does the speed of light in a medium compare to its speed in vacuum?
A. It is faster in a medium.
B. It is slower in a medium
C. It remains the same in a medium
D. It depends on the wavelength
20. A person with myopia (near sightedness) uses correctively lenses to see distant objects clearly. What type of lens is used and why?
A. Convex lens, to converge light rays
B. Concave lens to diverge light rays
C. Cylindrical lens, to correct astigmatism
D. Bifocal lens, to correct both near and vision.
21. Which of the following aspects primarily distinguishes civil engineering from mechanical engineering?
A. Civil engineering involves more programming skills compared to mechanical engineering.
B. Civil engineering focuses on the design and construction of infrastructure, whereas mechanical engineering emphasizes design and manufacturing of mechanical system.
C. Civil engineering requires knowledge of biological systems, while mechanical engineering doesn't.
D. Civil engineering is mainly concerned with electronics, whereas mechanical engineering is focused on software development.

22. If the speed of the signal transmitted from the RADAR is C (speed of light), and the total time taken for the signal to travel from the RADAR to the target and back is t , the range R between the RADAR and the target can be calculated using the equation:
 A. $R = C \times t$ B. $R = (C \times t) / 2$ C. $R = (C \times t) / 6$ D. $R = (C \times t) / 8$
23. Which one of the following is the basis of all modern communication technologies?
 A. antenna B. satellite C. Electromagnetic wave D. air
24. An object of mass m covers a maximum vertical distance of 5m when it is projected at an angle of 30° from the ground. Calculate the velocity with which it was thrown.
 A. 20m/sec B. 10m/sec C. 7m/sec D. 8m/sec
25. A car moves around a circular path of a constant radius at a constant speed. Which of the following statements is true?
 A. The car's velocity is constant
 B. The magnitude acceleration is constant
 C. The car's acceleration is zero
 D. The car's velocity is directed toward the center.
26. If the force applied is perpendicular to the handle of the spanner as shown in the diagram, find the torque exerted by the force about the center of the nut,
 A. $27.5 \times 10^{-2} \text{Nm}$ B. $30.5 \times 10^{-2} \text{Nm}$ C. $23.5 \times 10^{-1} \text{Nm}$ D. $37.5 \times 10^{-2} \text{Nm}$



27. Which one of the following is **Not** correct?
 A) Planet is moving fastest when it is at perihelion
 B) Planet is moving slowest when it is at aphelion
 C) At aphelion the planet is closer to the sun
 D) the gravitational force (centripetal force) is greater at perihelion than aphelion.
28. What is the new gravitational force F between two point objects (A and B) separated by distance R . If the mass of A is doubled and R is tripled?
 A. $2F/9$ B. $9F$ C. F D. $2F/3$
29. A girl is standing on two feet. She then stands on one foot. How does the pressure on her foot compare to when she is standing on two feet?
 A. It is cut in half C. It is quadrupled
 B. It is doubled D. Impossible to determine
30. A manometer containing gas, open to atmosphere, the fluid column in the open arm is 10cm above the gas connected arm, Determine the absolute pressure within the tank, if

the local atmospheric Pressure is 98kPa is applied to open tube. The specific gravity of the gas is 0.82.

- A. 96.1kpa B. 100.2kpa C. 98.82kpa D. 97kpa

31. Three containers are used in a physics lab. All containers have different bottom area but the same height. A physics student fills each of the containers with the same liquid to the maximum volume. Which of the following is true about the pressure on the bottom in each container?

- A. $P_1 > P_2 > P_3$ C. $P_1 < P_2 < P_3$
B. $P_1 > P_2 < P_3$ D. $P_1 = P_2 = P_3$

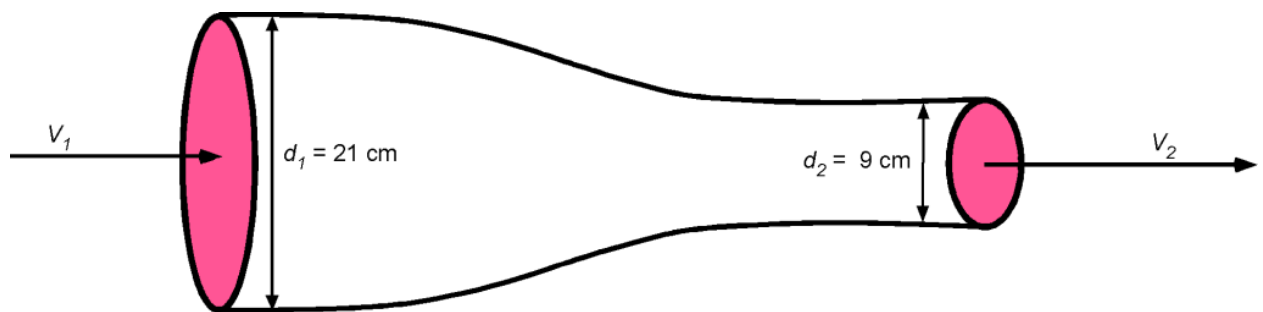
32. Three blocks of equal volume are completely submerged into water. The blocks made of different materials: aluminum, iron and lead. Which of the following is the correct statement about the buoyant force on each block?

($\rho_{\text{aluminum}} = 2700 \text{ kg/m}^3$, $\rho_{\text{iron}} = 7800 \text{ kg/m}^3$, $\rho_{\text{lead}} = 11300 \text{ kg/m}^3$)

- A. $F_b \text{ of aluminum} > F_b \text{ iron} > F_b \text{ lead}$
B. $F_b \text{ aluminum} < F_b \text{ iron} < F_b \text{ lead}$
C. $F_b \text{ aluminum} < F_b \text{ iron} > F_b \text{ lead}$
D. $F_b \text{ aluminum} = F_b \text{ iron} = F_b \text{ lead}$

33. A gas of density 1.7 kg/m^3 flows through a pipe with a volume flow rate of $0.12 \text{ m}^3/\text{sec}$. The pipe has an inlet section diameter of d_1 of 21cm and an outlet section diameter d_2 of 9cm. assuming an ideal incompressible fluid flow, calculate the approximate flow velocities at the pipe's inlet and outlet, i.e., V_1 and V_2 , respectively.

- A. $V_1 = 11\pi \text{ m/sec}$ and $V_2 = 59\pi \text{ m/sec}$.
B. $V_1 = 59\pi \text{ m/sec}$ and $V_2 = 11\pi \text{ m/sec}$.
C. $V_1 = 8\pi \text{ m/sec}$ and $V_2 = 51\pi \text{ m/sec}$.
D. $V_1 = 51\pi \text{ m/sec}$ and $V_2 = 8\pi \text{ m/sec}$.



34. Why is an unmagnetized iron object attracted to a magnet?
- A. The iron has magnetism induced by the magnet.
B. The iron has charged particles which attract the protons in the magnet.
C. The iron has charged particles which attract the electrons in the magnet.
D. The iron is attracted by the Earth's magnetic field.
35. Choose the **incorrect** statement from the following regarding magnetic lines of field;
- A. The direction of magnetic field at a point is taken to be the direction in which the North Pole of a magnetic compass needle points.
B. Magnetic field lines are closed curves.

- C If magnetic field lines are parallel and equidistant, they represent zero field strength.
 D. The relative strength of the magnetic field is shown by the degree of strong closeness of the field lines.

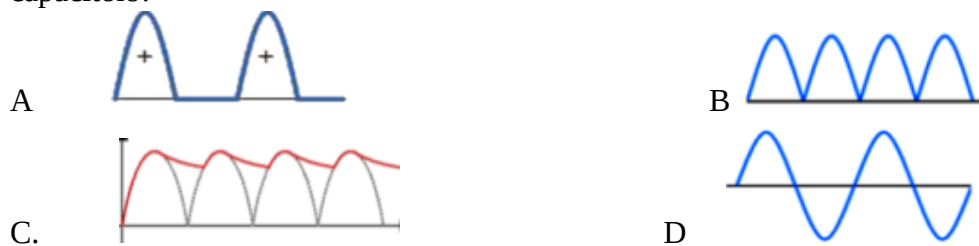
36. The magnetic flux through a 50-turn coil increases at the rate of 0.05 Wb/s. What is the induced emf between the ends of the coil?

- A. 2.5 V B. 5 V C. 10 V B.25 V

37. The semiconductor diode used as-----

- A. Oscillator B. Amplifier C. Rectifier D. Modulator

38. Which one of the following is the graph show full wave rectification output using capacitors?

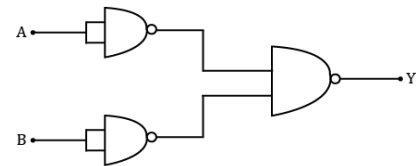


39. Which one of the following statement is **Not** correct

- A. Emitter is provides majority charge carriers by which current flows in the transistor
 B. The size of the collector region is larger than the emitter and base
 C. The base region of the transistor is heavily doped.
 D. Base region of the transistor is provides proper interaction between emitter and base

40. The combination of logic gates shown in circuit is given by A=0 and B= 1 then the output Y will be;

- A. 0
 B. 1
 C. 1 always irrespective of the input
 D. 0 always irrespective of the input



Refer to the following experiment to answer question below.

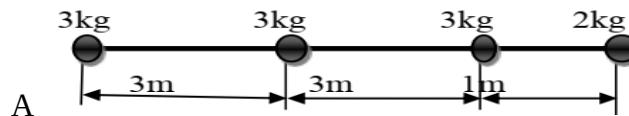
Three students have made multiple measurements of the length of a stick in cm. Their results are summarized in the table below. The correct value for the length of the stick is 35.9cm.

	Trial 1	Trial 2	Trial 3
Student A	35.4 cm	36.1 cm	35.7 cm
Student B	31.8 cm	34.1 cm	41.5 cm
Student C	39.2 cm	39.3 cm	38.9 cm

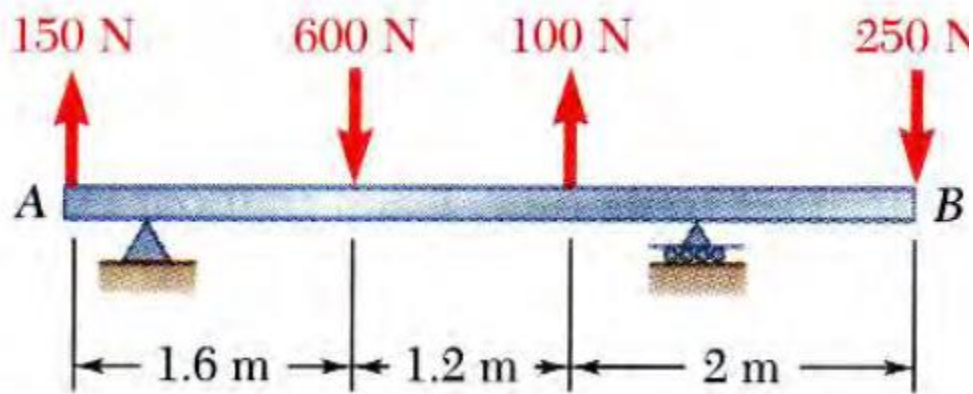
41. Which student's measurements have high precision but low accuracy?

- A. Student A C. Student C
 B. Student B D. Student C and B

42. Given four vectors $A = 2i - j$, $B = 4i - 2j$, $C = i - j$, and $D = 2i + 3j$, which pair of these vectors are collinear?
 A. C and D B. A and B. C. B and C D. A and C
43. If an object is in a state of uniformly accelerated motion, then its
 A. Velocity is constant.
 B. Velocity versus time graph is a curved line.
 C. Velocity versus time graph is a horizontal line.
 D. Velocity changes proportional to time
44. 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.
45. 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.
46. Find the distance of the center of mass of the system shown in the diagram from point A.
 The rod is massless.



- A. 3.73 m C. 2.45 m.
 B. 5.86 m D. 2.09 m.
47. As shown in the figure below four forces act on the system. Calculate the resultant moment of force about A.
 A. 1200 Nm clockwise B. 1880 Nm clockwise
 C. 1500 Nm Anti-clockwise D. 1100 Nm anti-clockwise



48. A ball having a mass of 2.5 kg and velocity 2m/s east ward collides with another ball having a mass of 1kg and velocity of 1m/s also east ward. After collision the more massive ball has a velocity of 1m/s eastward. What is the velocity of the less massive ball?
- A. -2.25m/s eastward B. 2.25 m/s west
C. 2.25 m/s eastward D. 2.4 Eastward
49. Which of the following best describes streamline flow?
- A. The flow where fluid particles move chaotically.
B. The flow where fluid particles follow irregular paths.
C. The flow where fluid particles follow parallel paths.
D. The flow where fluid particles move in circular paths.
50. A cylindrical rod subjected to tensile force has an original length of 2meters and a diameter of 0.1meters. The rod's Young's modulus is 210Gpa. If the tensile force causes the rod to stretch by 1mm, what is the stress in the rod?
- A. 10.5Mpa B. 210 Mpa C. 1.05 Mpa D. 105 Mpa