YEKA SUB-CITY EDUCATION OFFICE (YSEO)

ETHIOPIAN UNIVERSITY ENTRANCE MODEL EXAMINATION (EUEME)

PHYSICS, TIKIMT 2013/OCTOBER 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 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

Tikimt 2013/October 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	$8.85 \times 10^{-12} C^2/N.m^2$
Charge of an electron	e	$1.6 \times 10^{-19}C$
Permittivity of free space	μ_0	$4\pi x10^{-7}Tm/A$
Universal gas constant	R	8.31 J/mol. k.
Planck's constant	h	$6.63 \times 10^{-34}J.s$
Electron mass	M_e	9.11×19^{-31} kg
Proton mass	M_p	1.67×10^{-27} kg
ln2 = 0.693, $\pi = 3.14$	p	$1.6 \times 10^{-19}C$
$Sin30^0 = cos60^0 = 0.5$,	$cos90^0 = sin0^0 = 0$	
$Sin37^0 = cos53^0 = 0.6$,	$sin90^0 = cos0^0 = 1$	
$Sin45^0 = cos45^0 = 0.707$	Speed of light in air, $c = 3 \times 10^8 m/s$	
$Sin53^0 = cos37^0 = 0.8$		
$Sin60^0 = cos30^0 = 0.866$		

1. A systematic procedure scientists use to acquire knowledge in science is:
   A. Existing knowledge. C. Do experiment.
   B. Scientific method. D. Draw conclusions.
2. Random error can be reduced by:
   A. Taking repeated measurement and average them.
   B. Taking reading of the measured value perpendicularly.
   C. Making the appropriate instrument adjustment.
   D. Redesigning the measuring instrument
3. What can be concluded when the number of significant figures decreases?
   A. True reading increases. C. Precision decreases.
   B. Uncertainty increases. D. Accuracy decreases.
4. Vectors that act on the same line are:
   A. Coplanar vectors. C. Null vectors.
   B. Equal vectors. D. Concurrent vectors.
5. Two vectors are $\vec{A} = \hat{\imath} + \hat{\jmath} + 2k$ and $\vec{B} = -3\hat{\imath}+4\hat{k}$. the scalar projection of $\vec{A}$ on to $\vec{B}$ is:
   A. 1 B.2 C. 4 D. 5.
6. Given vectors $\hat{A}=\sqrt{3}\hat{\imath}+\hat{\jmath}$ and $\hat{B}=\sqrt{3}\hat{\imath}-\hat{\jmath}$. What is the smaller angle between the vectors?
   A. 30^0. B. 53^0. C. 45^0. D. 60^0
7. The velocity of a particle is given by $v(t) = 20t^2 – 100t + 50$. At what time, the acceleration of the particle becomes zero?
   A. 3 sec. B. 2 sec. C. 3.5 sec. D. 2.5 sec.
8. A car travelling at a constant acceleration covers the distance between two points 180m a part in 6sec. If the car is starting from rest and its speed at the second point is 45m/s, what is the acceleration of the car?
   A. $5m/s^2$ B. $10m/s^2$ C. $15m/s^2$ D. $20m/s^2$
9. A ball is thrown vertically down ward with an initial speed of 20m/s from a height of 60m. What is the speed of the ball just before it strikes the ground?
   A. 20m/s B. 30m/s C. 40m/s D. 50m/s
10. In one dimensional motion where the velocity changes linearly with time, the slope of a velocity-time graph represents:
    A. Displacement B. Acceleration. C. Velocity D. Speed.

11. A ball is thrown with a velocity of 20m/s at an angle of $15^{\mathbf{0}}$ above the horizontal. Neglecting air resistance, what is the range of the ball?

    A. 30 m. B. 25 m. C. 10 m. D. 20 m.

12. 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.

13. Two masses 4 kg and 6 kg are attached to the end of a light string passing over a pulley. Assume pulley is massless, what are the **tension** and **acceleration** respectively?

    A. 24N, $2m/s^{\mathbf{2}}$. B. 48N, 2 m/s^2 C. 48N, $4m/s^{\mathbf{2}}$ D. 24N, $4m/s^{\mathbf{2}}$.

14. Which one of the following statements is true about the motion of a particle in a circular path?

    A. The centripetal acceleration is constant if the particle's speed is constant.

    B. The tangential acceleration can be perpendicular to the velocity vector of the particle.

    C. The centripetal acceleration is always in the direction perpendicular to the velocity vector of the particle.

    D. The acceleration is always perpendicular to the velocity vector of the particle.

15. A stone tied to a string is whirled in a horizontal circle with a constant tangential speed of 10m/s. If the length of the string is 15cm, what are the angular velocity and centripetal acceleration respectively?

    A. 500 rad/s, 50 m/s^2. C. 50 rad/s, 500 $m/s^{\mathbf{2}}$

    B. 50 rad/s, 50 m/s^2. D. 500 rad/s, 500 $m/s^{\mathbf{2}}$.

16. Which statement is correct about conservative and dissipative forces?

    A. The work done by conservative forces is path dependent.

    B. The work done, along a closed path, by non-conservative forces is nonzero.

    C. Gravitational force is an example of non-conservative force.

    D. Friction is an example of conservative force.

17. If a force of 40N is used to stretch a spring which has a spring constant of 350N/m, then how much energy is stored in the spring?

    A. 2.12J. B. 21.2J. C. 5.12J. D. 15.2.J

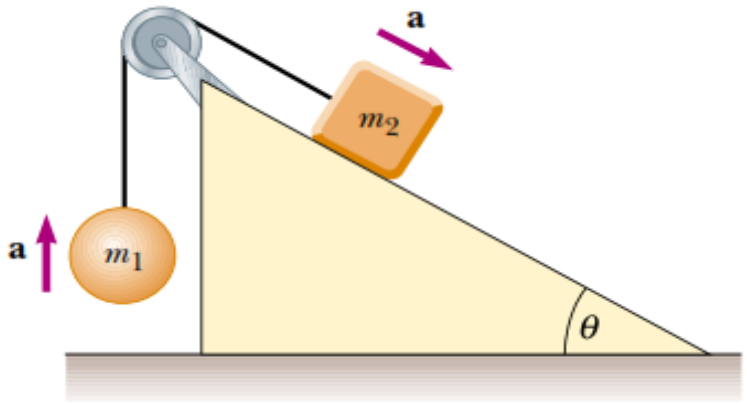
18. A block of mass m_1 and m_2 are attached by a lightweight cored that passes over a frictionless pulley of negligible mass as shown figure below. If the block lies on a frictionless incline of angle, what is the **tension** of the cored?

A. $\frac{M_1M_2g(\cos\theta+1)}{M_1+M_2}$.

C. $\frac{M_1M_2g(\sin\theta-1)}{M_1+M_2}$.

B. $\frac{M_1M_2g(\sin\theta+1)}{M_1+M_2}$

D. $\frac{M_1M_2g(\cos\theta-1)}{M_1+M_2}$.



19. 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.
20. A spring with a spring constant of 300 N/m is stretched 20 cm in 2 seconds. What is the power applied to stretch the spring?

A. 3 W. B. 6 W. C. 30 KW. D. 60 KW.

21. Which of the following is correct about collision?
    A. Momentum is conserved on any kind of collision.
    B. Kinetic energy is conserved on any kind of collision.
    C. Momentum is conserved on only elastic of collision.
    D. Kinetic energy is conserved on only an inelastic of collision.

22. A fly wheel rotating about fixed axis has a rotational kinetic energy at 180J when its angular speed is 10 rad/s. Then what is the moment of inertia of the wheel about the axis of rotation?

A. $7.6 kgm^2$**.** B. $3.6\ kgm^2$. C. $7.2\ kgm^2$. D. $3.2\ kgm^2$**.**

23. 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.

24. A solid sphere roles down a hill of height 49m. What is the velocity of the ball when it reaches the bottom? ($I=2/5MR^2$)

A. $\sqrt{490}$ m/s. B. $\sqrt{700}$ m/s. C. $\sqrt{70}$ m/s. D. $\sqrt{409}$ m/s.

25. The angular position of a point on a wheel can be described by $\theta(t) = 5+2t+2t^{2.}$ Determine the angular acceleration of the point at t=0 and t=3sec.

A. $4 rad/s^2$ B. $3 rad/s^2$ C. $10 rad/s^2$ D. $8 rad/s^2$

26. The requirements for a body to be in equilibrium are:

A. The linear moment of the body must be zero.

B. The angular moment of the body must be zero.

C. The vector sum of all forces and external torques must be zero.

D. All of the above.

27. Which one is **TRUE** about the moment of inertia of a body?

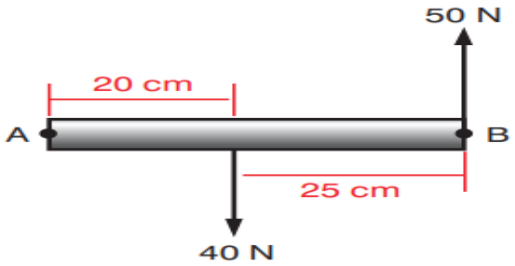
A. The moment of inertia depends on mass of the body

B. The moment of inertia depends on size of the body which axis is being considered.

C. The moment of inertia is a measure of the manner in which the mass of that a body is distributed in relation to the axis about which the body is rotating.

D. All of the above.

28. If two forces act on a bar as shown in figure below, what is the net torque about axis B?



A. 10Nm clockwise. C. 14.5Nm anti-clockwise.

B. 14.5Nm clockwise. D. 10Nm anti-clockwise.

29. 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.
30. Which element is correct about pressure under a fluid in container?
    A. It depends on the volume of the fluid. C. It depends on the shape of the container.
    B. It depends on the density of the fluid. D. It is independent of the depth of the fluid.
31. Streamline flow is a type of fluid flow where the fluid travels smoothly in regular layers. What is the reason for this happen?
    A. Velocity and pressure is constant. C. Velocity and pressure is increase.
    B. Velocity increase but pressure is constant. D. Velocity and pressure is decrease.
32. The terminal conductivity of copper is 390W/m/K. Calculate the rate of heat flow through a copper bar whose area is $4cm^2$ and whose length is 0.5m if there is a temperature difference of 30^0C maintained between its ends.
    A. 3.6w B. 5.9w C. 8.6w D. 9.4w.
33. A very large open tank is full of oil whose density is 800 kg/m^3. If the absolute pressure at the bottom of the tank is $1.81x\ 10^5$pa, then what is the depth of the coil? (atm=$1.01x10^5$pa)
    A. 10m B. 75m C. 100m D. 9.5m
34. If a certain gas ($\gamma = \frac{3}{2}$) with initial Pressure P and initial Temperature T adiabatically compressed to $\frac{1}{4}$ of its original volume, then what is the new temperature?
    A. $\frac{3}{2}$ T. B. 2 T. C. $\frac{2}{3}$ T. D. 3 T.
35. Which of the following statements is correct about entropy?
    A. For the reversible isobaric process, entropy is zero.
    B. For the reversible isochoric process, entropy is zero.
    C. For the reversible adiabatic process, entropy is zero.
    D. For the reversible isothermal process, entropy is zero.
36. What is the internal energy of one mole of nitrogen gas at a pressure of 50 Pa occupying a volume of $5 \times 10^4\ cm^3$?
    A. 4.75J. **C.** 1.75J.
    B. 2.75J. D. 3.75J.

37. Carnot engine is operating between two heat reservoirs of 400K and 300K. If the engine receives 4000J of heat energy from the reservoirs at 400K in each cycle. How much mechanical work does the engine perform during each cycle?

    A. 3000J. B. 1000J. C. 2000J. D. 4000J.

38. In a thermodynamic process 200J of work is done on the system and 70J of heat energy entered to the system. Then, by how much is the internal energy of the system changes?

    A. 130J. B. 200J. C.270J. D.70J.

39. Which of the following statement is **FALSE** about wave?

    A. Sound wave is an example of longitudinal 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 electromagnetic wave.
    D. In longitudinal wave, the vibration of the particles of the medium is parallel to the motion of the wave.

40. The amount of damping that leads to the oscillator settling back to its equilibrium position in the shortest possible time is,

    A. Over damping. B. Heavier damp C. critical damping. D. light damping.

41. An object moves with SHM of amplitude 10cm and time period of 2sec.The maximum velocity of the object is:

    A. 3.14m/s. B. 0.314m/s. C. 31.4m/s. D. 314m/s.

42. The intensity of the sound is $2x10^{-6}$ W/m^2 at a distance of 12m from the explosion of the rocket. Find the distance from the source at which the intensity is $8x10^{-6}$ W/m^2?

    A. 6m. B. 3m. C. 4m. D. 9m.

43. Monochromatic light of wavelength $4x10^{-6}$ m illustrated a pair of narrow slits 2mm apart. What is the bright fringe width in the interference pattern formed on a screen 2m away?

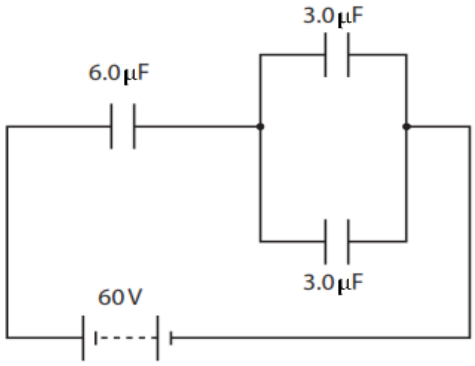
    A. 4.5mm. B.3mm. C.3.5mm. D.4mm.

44. Which one of the following indicates the wavelength of a travelling wave?

    A. The distance between an adjacent trough and peak.
    B. The amplitude of the wave.
    C. The distance between a node and antinodes.
    D. The distance between two adjacent points which are in phase.

45. Which one of the following is **WRONG** statement?
    A. In a single slit experiment, the width of central maxima is twice as wide as the ferst order maxima.
    B. In a single slit experiment, the width of first order maxima is twice as wide as the central maxima.
    C. Every point on a wave front acts as a source of spherical secondary wavelets.
    D. Frequency remains constant when a light travels from one medium to another.

46. Three capacitors are connected to a d.c. supply as shown figure below. What are the charge and potential difference across 6μF capacitor respectively?



A. 18μF, 30V.
B. 18μF, 60V.
C. 180μF, 30V.
D. 180μF, 60V.

47. The distance between two point charges is doubled. What will happen to the force of interaction between the charges?
    A. The force will be doubled.
    B. The force will be reduced by half.
    C. The force will be reduced by a factor of $^1/_4$.
    D. The force will not be affected.

48. One of the following statements is **NOT** characteristics of electric field.
    A. An electric field is the region around a charged object where another charged object will experience a force.
    B. Lines of electric field have a direction which moves away from negative and towards positive.
    C. The direction of electric filed is the direction of force acting on a small positive test charge.
    D. Lines of electric flux do not cross over each other.

49. The capacitance of a parallel plate capacitor is 10μF. if the distance between the plates is halved, keeping all other quantities constant, and then what is the new capacitance of the capacitor?

    A. 0.2μF. B. 5μF. C. 10μF. D. 20μF.

50. A particle of mass $2x10^{-4}$kg and $8x10^{-6}$C is released in a region where there is a constant electric field of 250N/C. What is the acceleration of the electric filed?

    A. $10m/s^2$. B. $5m/s^2$. C. $15m/s^2$. D. $20m/s^2$.

