

YEKA SUB-CITY EDUCATION OFFICE (YSEO)
ETHIOPIAN SECONDARY SCHOOL LEAVING CERTIFICATE PHYSICS
MODEL EXAMINATION (ESSLCPME)
MEYAZIYA 2016/APRIL (2024).

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 Secondary School Leaving Certificate Model Examination
(ESSLCME)**

Physics

MEYAZIYA 2016/ APRIL (2024).

Number of Items: 50

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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.

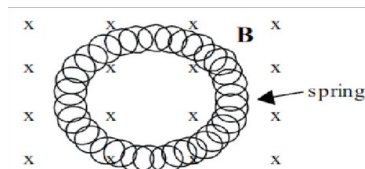
You may refer to the information given below when you work on some of the questions.

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	$1.6 \times 10^{-19}\text{C}$
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	$1.6 \times 10^{-19}\text{C}$
	μ_0	$4 \pi \times 10^{-7}\text{Tm/A}$
	P_{atm}	$1.01 \times 10^5 \text{pa}$
$\sin 30^\circ = \cos 60^\circ = 0.5,$	$\cos 90^\circ = \sin 0^\circ = 0$	
$\sin 37^\circ = \cos 53^\circ = 0.6,$	$\sin 90^\circ = \cos 0^\circ = 1$	
$\sin 45^\circ = \cos 45^\circ = 0.707$	Speed of light in air, $c = 3 \times 10^8 \text{m/s}$	
$\sin 53^\circ = \cos 37^\circ = 0.8$	$\rho_{\text{mercury}} = 13.6 \text{g/cm}^3$	
$\sin 60^\circ = \cos 30^\circ = 0.866$		

1. A person travels 5 km North and 12 km east. What will be the displacement from the initial point? A. 10 km B. 13 km C. 17 km D. 12 km
2. The displacement time graph of an object moving along the x- axis is a straight line with a positive slope. The object has a
 - A. Constant velocity
 - B. Constant acceleration
 - C. constant non zero acceleration
 - D. steady increasing velocity
3. Suppose you are carrying a bag of books. Which of the following statement is correct?
 - A. The force you exert is oppositely directed to the force the book exerts.
 - B. The force you exert is larger and directed oppositely to that the book exerts.
 - C. The two forces are equal in magnitude and parallel.
 - D. The force you exert on the books is larger.
4. A 0.2kg ball of mud falls vertically onto a 2.8kg car that is rolling freely at 3m/s on a horizontal surface. What is the final speed of the car?
 - A. 3m/s
 - B. 5.6m/s
 - C. 2.8m/s
 - D. 0.4m/s

5. The driver of a 200kg car travelling at 20m/s applies the breaks of the car. If the breaks provide a frictional force of 400N.which one is the stopping distance of the car?
 A. 200m B. 100m C. 300m D. 400m
6. Which one of the following is odd from the other?
 A. Crow bar B. Wheel barrow C. hammer D. scissors
7. An object hangs from a spring. The balance indicates 30N in air and 20N when totally submerged in water with density 1000kg/s^2 . What is the volume of the object?
 A. 10^3m^3 B. 10^{-1}m^3 C. 10^{-6}m^3 D. 10^{-3}m^3
8. A refrigerator converts 500g of water at 0°C in to ice 0°C . What amount of heat is extracted from the water? A. 168kJ B. 1.68kJ
 C.1.68J D.168J
9. A Lion is calling her mate using infrasonic sound with a frequency of 50HZ. If her mate is 476m away and the speed of sound is 340m/s. how many cycles of sound wave are there between the two animals? A. 7
 B. 6 C. 9 D. 5
10. A certain body is thrown upwards at an angle of 30° to the horizontal with a speed of 20m/s. what is the time the body takes to reach the maximum height?
 A. 2sec B. 5sec C. 0.5sec D. 1sec
11. The body in rotational equilibrium has a constant
 A. Acceleration C. velocity
 B. Angular acceleration D. Angular velocity.
12. Which one of the following statement is **FALSE** about electric charge?

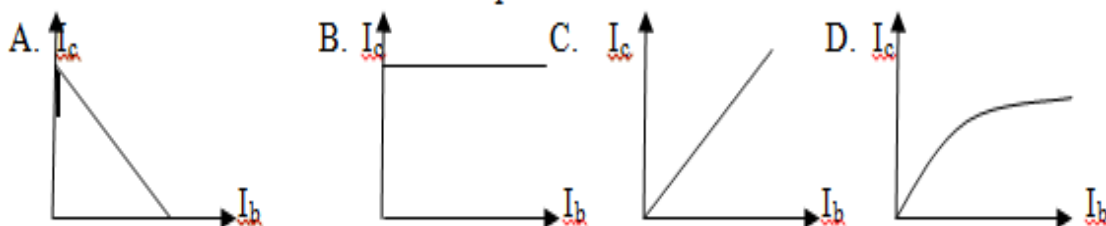
- A. Like repel and unlike charges attract each other
 B. Charge is conserved
 C. Charge is not quantized
 D. The force between charges varies as the inverse square of their separation
13. Two positive point charges repel each other with force of 0.16N when their separation is 1.5m.what force do they exert on each other when their separation is 1m?
 A. 0.54N B. 0.64N C. 0.24N D. 0.36N
14. What is the current maintained in a 5.0Ω resistance by 5 identical cells each of emf 1.5 V and internal resistance 0.5Ω , when they are connect in series?
 A. 0.3 A B. 1 A C. 2 A D. 0.5
15. The direction of the force acting on a current carrying conductor directed up ward is as shown. What is the direction of the magnetic field?
 I F
- A. Into the plane of the page.
 B. In the direction of the current force.
 C. In the direction of the force.
 D. out of the plane of this force.
16. A metal spring has its ends attached so that it forms a circle. It is placed in a uniform magnetic field, as shown above. Which of the following will NOT cause a current to be induced in the spring?



- A. Changing the magnitude of the magnetic field

- B. Increasing the diameter of the circle by stretching the spring
- C. Rotating the spring about a diameter
- D. Moving the spring parallel to the magnetic field

17. Which one of the following graphs shows relation between collector current and base current when a transistor acts as an amplifier?



18. A radar wave is transmitted and later reflected off an aircraft, and received 1.2×10^3 second after being sent out. How far is the aircraft?

- A. 18km
- B. 180km
- C. 1.8km
- D. 0.18Km

19. The change in direction of light due to a change in speed as it moves from one medium to another is

- A. Reflection
- B. Refraction
- C. Diffraction
- D. Interference

20. A resistance of $10k \Omega$ having tolerance of 10% is connected in series with another resistance of $20k \Omega$ having a tolerance of 20%. The tolerance of combination is

- A. 10%
- B. 13%
- C. 17%
- D. 20%

21. The magnitude of the vector product of the two vectors is $\sqrt{3}$ times their scalar product. The angle between vectors is

- A. $\frac{\pi}{2}$
- B. $\frac{\pi}{6}$
- C. $\frac{\pi}{3}$
- D. $\frac{\pi}{4}$

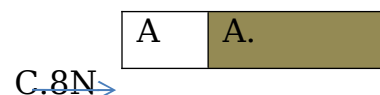
22. A ball thrown upward with a speed of v attains height h_1 . Another ball thrown upwards from the same point with a speed of $2v$ attains a height h_2 . Then, h_2 is equal to

- A. h_1 B. $2h_1$ C. $3h_1$ D. $4h_1$

23. Two blocks A and B of masses 4kg and 12 kg are placed on the smooth plane surface. A force of 16N is applied on A as shown. The force contact is

- A. 4N

$$F=16N$$



- B. 12N

- D. 16N

24. A particle of mass moving with velocity v strikes a stationary particle of mass $2m$ and stick to it. The speed of the system will be

- C. $\frac{v}{3}$

- D. $3v$

25. A 30g bullet initially travelling horizontally at 50 m/s penetrates 10cm into a wooden block. The average force it exerts is?

- 2500N

- C. 375

- D. 4500N

26. A solid sphere of mass 1kg rolls on the table with linear speed 1m/s. its total kinetic energy is? (Use $I_{sphere} = \frac{2}{5} mr^2$)

- C. 0.7J

- D. 1.4J

27. The sum of clockwise torque is the same as the sum of counter clockwise torque is

- A. Rotational Equilibrium.

- C. Angular momentum.

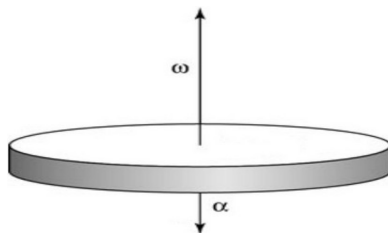
- B. Translational equilibrium.

- D. rotational and

- translational equilibrium.

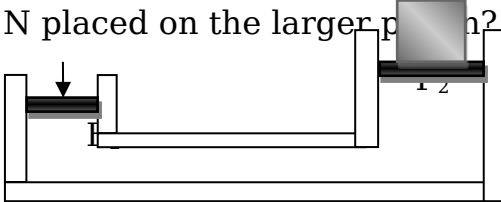
28. A very large open tank is of oil whose density is 800kg/m^3 .if the absolute pressure at the bottom of the tank is $1.51 \times 10^5 \text{ pa}$, then what is the depth of the oil?
- A. 9.25m B.6.25 C. 8.25 D. 7.25
29. The terminal conductivity of copper is 390W/m/K . Calculate the rate of heat flow through a copper bar whose area is 4cm^2 and whose length is 0.5m if there is a temperature difference of 30°C maintained between its ends. A. 3.6w B. 9.4w C. 8.6w D. 5.9w
30. Which basic concept are used explain common geological process and should geologist always make excavation too study the properties of minerals and rocks? **EXCEPT**
- A. Electromagnetic radiation C. Heat and heat flow
B. Electricity and magnetism D. Air Force
31. One of the following **NOT TRUE** about physics and Engineering?
- A. Mechanical engineering involves the production of products through chemical process.
- B. Electrical engineering involves with the design construction and maintenance of the physics and naturally built environment.
- C. Mechanical engineering deals with construction of aircraft, water craft, engines, robotics and others.
- D. Chemical engineering involves designing electrical circuits including motors, electric appliance and others.
32. Identify the difference between the diagnostic and therapeutic medical device?
- A. Diagnostic related to finding a suspected disease while therapeutic related to treatment.
- B. Serum analysis is a diagnostic procedure while administering antibiotic in the domain of therapeutics.

- C. Diagnostics are methods followed to detect the presence of a disease in the body while therapeutics is certain materials like vaccines, proteins.
- D. All are correct answer
33. Two projectiles are fired from ground level at equal speed but different angles one is fired at an angle of 30° and the other at 60° . The projectile to hit the ground first will be the one fired at (neglect air resistance)
- A. 60° C. Both hit at the same time
- B. 30° D. cannot be determined from the given information
34. If a long distance jumper athlete leaves the ground at angle of 53° above the horizontal surface at a speed of 10m/s, how far does he jump in the horizontal direction?
- A. 4.8m B. 6m C. 9.6m D. 12m
35. If the impulse of a rotating disc is non-zero what can you conclude?
- A. The change in angular momentum is non-zero
- B. The change in linear momentum is zero
- C. Impulse of the disc equals its moment of inertia
- D. The torque acting on an object is constant
36. Consider the following figure that describes rotation of an object about a fixed axis. Which one of the following is correct about rotation of the object?



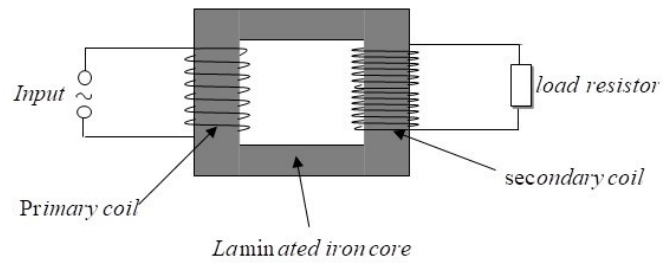
- A. The direction of rotation is clockwise.

- B. Angular velocity and angular acceleration are parallel to the plane of rotation.
- C. The angular velocity of the object is increasing
- D. The angular velocity of the object is decreasing
37. If the molecules of a substance move freely and occupy all the space available to them, then which of the following is true about the substance?
- A. It must be in liquid state. C. It must be in the gaseous state.
- B. It must have a definite shape. D. It must have a definite volume.
38. A block of lead has a greater density than a block of iron and both are denser than water. Compare, to buoyant force on a block of iron, the buoyant force on a block of lead is:
- A. The same if they have equal volumes C. The same if they have equal masses.
- B. Greater if they have equal masses D. Greater if they have equal volumes
39. Which one of the following describes Kepler's second law of planetary motion?
- A. Each planet moves in an elliptical path, with the Sun at one focus.
- B. The line that joins the Sun to the orbiting planet sweeps out equal areas in equal times.
- C. The square of the time it takes the planet to go round the Sun is proportional to the cube of its average distance from the Sun.
- D. The orbit of each planet is circular path.
40. The law that states every particle attracts every other particle in the universe with force directly proportional to the product of the masses and inversely proportional to the square of the distance between them is:
- A. Coulomb's law C. Faraday's law
- B. Newton's law of universal gravitation D. Kepler's law

41. Static fluid pressure depends on:
- A. Shape of the container
B. Total mass
C. Surface area of the container
D. Depth of the fluid
42. The cross- sectional areas of the small and large circular piston of hydraulic lift shown in figure below has a diameter 4cm and 8cm. respectively. What is the magnitude of the force must be applied to the small piston to lift $F_2 = 1600 \text{ N}$ placed on the larger piston?
- A. 6.25 N.
B. 25 N.
C. 400 N.
D. 100 N
- 
43. Which of the following statement is correct about Archimedes' principle?
- A. The volume of the object immersed in liquid is greater than the volume of the liquid displaced by the object.
B. Buoyant force is equal to the weight of displaced liquid.
C. The pressured applied to an enclosed fluid is transmitted to every part of the fluid without reducing in volume.
D. None of the above.
44. Atmospheric pressure increases as
- A. Latitude increase
B. Air temperature increase
C. Air density decrease
D. altitude decrease
45. A 3600kg circuit's elephant balances on one foot. If the foot is circular and has an area of 0.003m^2 .what is the pressure it exerts on the ground?
- A. $3 \times 10^6\text{pa}$ B. $6 \times 10^5\text{pa}$ C. $9 \times 10^5\text{pa}$ D. $1.2 \times 10^6\text{pa}$
46. A certain objects float F_1 , F_2 and F_3 . Of densities 0.9ρ , ρ and 1.1ρ respectively. The volume of the displaced fluid by the object is
- A. Least for F_2 B. Least for F_3 C. Least for F_1 D. Greatest for F_2

47. Which one of the following statements is correct about the effect and formation of the magnetic field?
- A. A magnetic field exerts a nonzero force on a stationary charged object.
 - B. A magnetic field exerts a nonzero force on a conducting wire placed in the field.
 - C. A uniform magnetic field can be created at all points around a long current carrying wire.
 - D. A magnetic field can be created in the space surrounding any charged object that is in motion.
48. An inductor has a self-inductance of 12 mH . The current in the circuit decreases at a rate of 2 A/s . What is the magnitude of the induced electromotive force?
- A. $2.4\pi\text{ V}$. B. $1.2\pi\text{ V}$. C. $2.4 \times 10^{-2}\text{ V}$. D. $1.2 \times 10^{-2}\text{ V}$
49. According to the law of electromagnetic induction:
- A. A constant magnetic flux crossing the surface of a circuit induced an emf in the circuit.
 - B. An emf is induced in a circuit when a constant magnetic field crosses its surface.
 - C. The magnitude of emf induced in a circuit is directly proportional to the rate of change the magnetic flux crossing any surface bounded by the circuit.
 - D. A changing magnetic field parallel to the plane of a circuit induces an emf in it.

50. A simple transformer is illustrated in the figure below. Why the iron



core is laminated?

- A. To increase the induced current in the primary coil.
- B. To increase the induced current in the secondary coil.
- C. To avoid heat exchange between the primary and secondary coils.
- D. To reduce the loss in power in the core due to eddy currents.

END

