YEKA SUB-CITY EDUCATION OFFICE (YSEO)
ETHIOPIAN SECONDARY SCHOOL LEAVING CERTIFICATE
PHYSICS MODEL EXAMINATION (ESSLCME)
TIR 2016/ JANUARY 2023/2024.

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 1Examination (ESSLCME)

Physics

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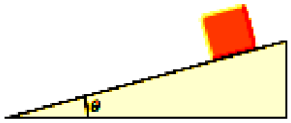
DIRECTIONS: Each of the following questions is followed by **four** possible alternatives. Read each question and carefully **blacken** the letter of your best choice on the separate answer sheet provided.

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_o	$8.85 \times 10^{-12}\ C^2/N.m^2$
Charge of an electron	e	$1.6 \times 10^{-19}C$
Electron mass	M_e	9.11×19^{-31} kg
Proton mass	M_p	1.67×10^{-27} kg
ln2 = 0.693, π = 3.14	p	$1.6 \times 10^{-19}C$
Electrostatic Constant	K	$9 \times 10^9\ Nm^2/c^2$
Gravitational Constant	G	$6.67 \times 10^{-11}\ Nm^2/kg^2$
$Sin30^0 = cos60^0 = 0.5$,	$cos90^0$¿ $sin0^0$¿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 x	

10^8m/s	
$Sin53^0 = cos37^0 = 0.8$	$\rho_{mercury} = 13.6\ g/cm^3$
$Sin60^0 = cos30^0 = 0.866$	

1. A body sets from rest with a constant acceleration of $8m/s^2$. What distances will it has covered after 3 seconds?
   A. 36m. B. 26m. C. 46m.
   D 30m.
2. A block of mass m slides down an inclined plane as shown in figure below. What is the acceleration of the block if the inclined plane has coefficient of kinetic friction μ_k?



   A. g $(\tan\theta - \cos\theta\,\mu_k)$. C. g $(\sin\theta - \mu_k$ ¿.
   B. g $(\sin\theta - \cos\theta\,\mu_k)$. D. g $(\cos\theta - \mu_k$ ¿
   .
3. A 60kg man jumps down ward from a 0.8m table. What is the speed when he hits the ground?
   A. 16m/s B. 150m/s C. 4m/s
   D.6m/s
4. A block is sliding down on a surface inclined at angle θ. If the coefficient of friction is μ, what is the mechanical advantage of the plane?
   A. $\frac{1}{\cos\theta}$. B. $\frac{1}{\sin\theta}$. C. $\frac{1}{\mu\cos\theta + \sin\theta}$.
   D. $\frac{1}{\mu\cos\theta}$.
5. Which of the following statements correctly describes the difference between mechanical and electromagnetic waves?

A. Mechanical waves transfer energy through space but mechanical waves do not.
B. Electromagnetic waves transfer energy through space but mechanical waves do not.
C. Mechanical waves can propagate only through physical medium, but electromagnetic waves can propagate even in vacuum.
D. Mechanical waves do not require a physical medium to propagate, but electromagnetic waves require a physical medium propagate.

6. Which of the following is **WRONG** about motion in a circle?
   A. When a body is moving in a vertical circle, the speed remains constant.
   B. When a body is moving in a horizontal circle, the velocity changes.
   C. When a body is moving in a horizontal circle, the speed remains constant.
   D. When a body is moving in a vertical circle, the speed does not remains constant.

7. A thin rod when rotated about an axis at the end of the rod has a moment of inertia $\frac{1}{3}ML^2$. The rod has a mass of 1.5kg and length of 1m. If the rod initially at rest gains a rotational kinetic energy of 100J, at what speed does it rotate?

   A. 20rad/s B. 10rad/s C. $10\sqrt{5}$ rad/s D. $20\sqrt{10}$ rad/s

8. The electric field strength at a point is defined by the force on?
   A. A source charge C. An electron
   B. A test charge D. A proton

9. 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.

10. If several resistors are connected in parallel, the equivalent resistance is:

A. Greater than any of the resistance in the group.

B. Less than any of resistance in the group.

C. Is equal to the average resistance in the group.

D. Equal to the sum of the resistance in the group.

11. Find the magnitude of the force felt by an electron travelling at an angle of 60^{0} to the earth's magnetic field at 1.4 x 10^{7} m/s.(the charge on the electron is 1.6 x $10^{-19}$and the magnitude of the earth's magnetic field is 5 x 10^{-5} T).

A. 0N. B. 9.7 x 10^{-17} N. C. 1.1 x 10^{-16} N. D. 8.6 x 10^{-17} N

12. Which of the following statements is **NOT** true?

A. An electric current can be induced in a circuit with a change in the cross-sectional area of the wire.

B. The induced *emf* in a circuit is directly proportional to the time rate of change of magnetic flux.

C. *Emf* can be induced in a circuit by change in the area enclosed by the loop.

D. An electric current can be induced in a circuit with a changing of magnetic field.

13. Which of the following is valid for both p-n-p as well as n-p-n transistor?

A. The emitter injects holes into the base region

B. The electrons are the minority carriers in the base region.

C. The Emitter Base junction is the forward biased for active operation.

D. When a biased in the active region, current flows into their emitter terminal.

14. You wish to obtain a magnification of -2 from a convex lens of focal length f. The only possible solution is to

A. Place a virtual object at a distance $\frac{3}{2}$ f from the lens.

B. Place a real object at a distance $\frac{3}{2}$ f from the lens.

C. Place a virtual object at a distance $\frac{2}{3}$ f from the lens

D. Place a real object at a distance $\frac{2}{3}$ f from the lens.

15. Which one the following is the law of reflection?

A. The angle of incident is equal to the angle of reflection.

B. The angle of incident is less than the angle of refraction.

C. The angle of incident is greater than the angle of reflection.

D. The angle of incident is equal to the angle of refraction.

16. Which of the following is **NOT TRUE** about accuracy of a measurement?

A. Accuracy refers to the closeness of repeatedly measured data to a true value.

B. Accuracy refers to the closeness of repeatedly measured data to each other.

C. Measurements of high precision, more likely to be accurate than those of poor precision.

D. Highly precise measurements are sometimes not accurate.

17. The vectors $2i + j + k$ is perpendicular to $i - 4j + \lambda k$, if λ is equal to

A. 0 B. -1 C. 2 D. 3

18. A projectile is fired at 60^0 with the horizontal. At the highest point of its path, the vertical component of its velocity is momentarily zero. What is the magnitude of its acceleration at this point? A. $20 m/s^2$. B. $10 m/s^2$. C. $5 m/s^2$. D. $0 m/s^2$.

19. A bullet of mass 0.01kg is fired into a sand bag of mass 0.49kg hanging from a tree. If the sand bag with bullet embedded into it swings away at 10m/s, then which of the following is the velocity of the bullet

A. 50 m/ s B 100 m/s C. 500 m/s D. 0 m/s.

20. Which of the following is correct about a work done for dissipative forces?

A. Path dependent.

B. The same as the loss in kinetic energy.

C. The same as the gain in potential energy.

D. The same as the potential energy stored in spring.

21. A disc of radius “R” with uniform distribution of mass “M” rotates about an axis perpendicular to its plane at the rim with angular speed “ω”. The moment of inertia of the disc about the axis through the center is $\frac{1}{2}MR^2$. What is the kinetic energy of the disc?

A. $\frac{1}{4}MR^2\omega^2$ B. $\frac{1}{3}MR^2\omega^2$ C. $\frac{1}{2}MR^2\omega^2$ D. $\frac{3}{4}MR^2\omega^2$

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 torque acting on it.

B. Dynamic equilibrium that occurs when a body is at rest and there is no 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 torque acting on it.

D. In rotational equilibrium, the sum of all external torques acting on the body is non-zero.

23. A material rod that is 8m long and 0.2cm² in cross – sectional area is found to stretch 0.4cm under a tension of 2000N. The Young’s Modulus for this material is:

A. 1×10^8 N/m². C. 1×10^4 N/m².

B. 2×10^9 N/m². D. 5×10^8 N/m².

24. Which of the following is the application of Pascal’s law?

A. Siphon to remove fluids C. Sucking of liquid into a syringe

B. Hydraulic brake in vehicles D. Working of submarines

25. How much heat would be absorbed by 2gm of ice at 0℃ dropped into water at 0℃ to melt it totally to water at 0℃? (Latent heat of melting, L = 340,000J/kg)

A. 340J B. 840J C. 680J D. 420J

26. How does Newtonian mechanics relate to stable equilibrium in the human body?
    A. Center of mass directly over the base for stability
    B. Wider base leads to instability
    C. Stability is unrelated to the center of mass
    D. Center of mass must be outside the base for stability.

27. Which one of the following types of engineering is used to designing electrical circuit including motors, electric appliance, optical fiber network, computers and communication link?
    A. Chemical engineering
    B. Mechanical engineering
    C. Civil engineering
    D. Electrical engineering
28. What is the basic difference between conventional x-ray and x-ray computerized tomography (CT) scan?
    A. X-ray creates 3D images.
    B. CT scan creates 3D imagines.
    C. CT used primarily to see bones and to detect cancer and pneumonia.
    D. X-ray more powerful than CT scan.
29. One of the following is NOT the major physics knowledge is used in defense radar system to detect the enemy target?
    A. Modern electronics C. Nuclear physics
    B. Optics D. Anechoic
30. Which one of the following is correct about physics in communication?
    A. Optical fiber is wireless communication.
    B. Radio is wired communication.
    C. Infrared wave is wired communication.
    D. Microwaves are wireless communication.
31. Which one of the following statement is correct about two dimension motion?
    A. In a projectile motion the vertical and horizontal parts are independent to each other.
    B. The maximum range of projectile can achieved at an angle of 90^0.
    C. The maximum height of projectile can achieved at an angle of 45^0.

D. The velocity of projectile along horizontal component of projectile is not constant.

32. If a long distance jumper athlete leaves the ground at angle of 37° 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

33. A ball is thrown horizontally with a velocity of 10m/s from a top of building 80m high. What is the time taken to reach the ground?

A. 4sec B. 6sec C. 5sec D. 3sec

34. The motion of a body along a curved path with constant speed is:

A. Rotary motion. C. vibratory motion.

B. Uniform circular motion D. Straight line motion.

35. A particle move in the circular path of radius 4m with a centripetal acceleration of 64m/s^2. The angular speed of the particle is

A. 4 rad/s B. 6 rad/s C. 9 rad/s D. 2rad/s

36. A pulley is rotating at frequency of 20rev/min. A motor speeds up the wheel so that 30sec later the frequency of the motion is 60rev/min. How far wills a point on the pool 0.3m from its center has travelled during that period?

A. 4.2m B. 0.13m C. 125.7m D. 37.68m

37. 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.

38. If earth orbits the sun at double of its present radius, the year on the earth will be

A. 366days B. $365^{\sqrt{2}}$ x2 days C. $\frac{365}{2}$ days

D. 365 x 4 years

39. Kepler's law of area is a consequence of

A. Conservation of energy.
C. Conservation of linear momentum.
B. Conservation of mass.
D. Conservation of angular momentum.

40. A system consisting m_1 and m_2 separated 'r' is immersed in water. What is the effect on the gravitational force?

A. No effect B. It is weakened C. It becomes stronger D. It became zero.

41. The gravitational force of attraction between two bodies each mass 10g separated by 1m is

A. 6.67×10^{-11}N
C. 6.67×10^{-9}N
B. 6.67×10^{-19}N
D. 1N

42. 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 1.81×10^5pa, then what is the depth of the coil? ($p_{atm}=1.01 \times 10^5$pa)

A. 10m B. 9.5m. C. 75m. D. 100m.

43. According to Archimedes' principle, if a solid object floats, the volume of displaced water is equal to the volume of

A. The portion of the object that is above the water.
B. The portion of the object that is submerged.
C. Half of the object.
D. The whole object.

44. The direction of heat flow is from:

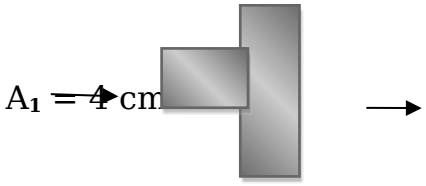
A. High pressure to low pressure
C. High temperature to low temperature

B. High density to low density emissivity to lower one

D. A point of higher

45. An object with a mass of 150kg and a volume of 0.75m^3 is floating in a liquid of density 0.8g/cm^3. What percentage of the object's volume will be submerged below the surface of the fluid? A. 25% B. 50% C. 75% D. 100%

46. 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.

A_2 =12cm^2

C. 3.3 m/s.

D. 3.6 m/s.

47. Pressure at the bottom of a liquid column is independent of:

A. The density of the fluid

B. The depth of the point

C. Shape of the column

D. The acceleration due to gravity

48. Solid resist all types of stress and compression because:

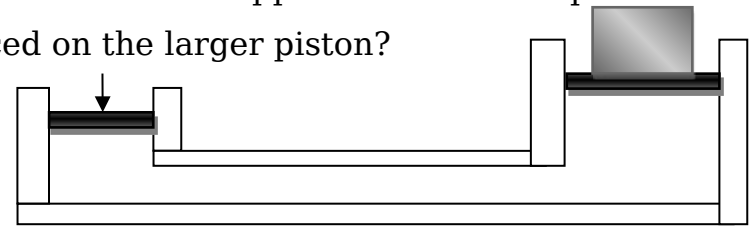
A. The atoms are able to move freely.

B. The atoms are not able to move freely

C. The atoms are not fixed distance apart.

D. The atoms would not be forced in to one another.

49. The cross- sectional areas of the small and large pistons of a hydraulic lift shown in figure below are 6cm^2 and 0.03 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 N placed on the larger piston?



A. 1.5 X 10^5 N.

B. 3.0 X 10^2 N.

C. 7.5 x 10^4 N.

D. 3.0 X 10^6 N.

50. Which one of the following are the major components of high- pressure equipment?

A. High pressure gas cylinder
B. High pressure washers
C.A and B
D. None of them

END