ADDIS ABABA EDUCATIN BUREAU

2012/2020 GRADE 12 PHYSICS MODEL EXAMINATION

TIME ALLOWED: 2HOURS

GENERAL DIRECTIONS

THIS BOOKLET CONTAINS **PHYSICS** EXAMINATION FOR THE NATURAL SCIENCE CANDIDATES ONLY. IN THIS EXAMINATION, THERE ARE A TOTAL OF 50 MULTIPLE CHOICE QUESTIONS.

THERE IS ONLY ONE BEST ANSWER FOR EACH QUESTION. CHOOSE THE CORRECT ANSWER FROM THE SUGGESTED OPTIONS AND BLACKEN THE LETTER OF YOUR CHOICE ON THE ANSWER SHEET. USE ONLY PENCILE TO MARK YOUR ANSWERS.

YOU WILL BE 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 ATTEMT 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.

Read the Following Questions Carefully and Write Your Appropriate Answer on Your Provided Answer Sheet!!

1. Two students perform an experiment in which they drop a ball from rest a known height above the ground and measure the speed of the ball just before it strikes the ground. From repeated measurement, the students estimate the uncertainty in the measured speed of the ball to be 10%. Which of the following gives the uncertainty in the kinetic energy of the ball? (Assume the uncertainty in the ball's mass is negligibly small.)

(A) 5% (B) 10% (C) 15% (D) 20%

2. The sum and difference of two non-zero vectors A and B are equal in magnitude. What can you conclude about these two rectors?

(A) **A** and **B** have the same direction
(C) **A** and **B** have opposite direction
(B) **A** and **B** have the same magnitude
(D) **A** and **B** are perpendicular to each other

3. A vector $\vec{A}$ has magnitude 10 units and acts at an angle of 53^0 from the positive x- axis. What are the magnitudes of the x and y components respectively?

(A) 8 units, 6 units
(C) 14 units, 8 units
(B) 6 units, 8 units
(D) 8 units, 14 units

4. When $|\vec{A}| = 2$, $|\vec{B}| = 4$, and the angle between $\vec{A}$ and $\vec{B}$ is 45^0. What is $|\vec{A} \times \vec{B}|$?

(A) 8 (B) 4 (C) $4\sqrt{2}$ (D) $2\sqrt{2}$

5. All are correct about the law of thermodynamics **EXCEPT** one.

(A) Zeroth law indicates that thermal equilibrium.
(B) First law is about decreases in internal energy
(C) Second law works in reveres of refrigerator
(D) Third law related to absolute entropy

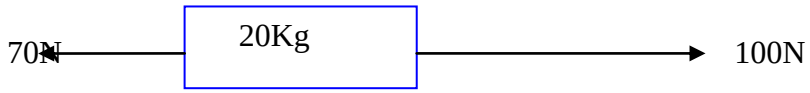
6. At sea level, atmospheric pressure is 1.0 X 10^5 pas, temperature is 40K and the density of air is $0.5\frac{\text{Kg}}{\text{m3}}$. What is the density of the air at the top of Entoto Mountain, where the temperature is 30K and atmospheric pressure is 3X 10^4 Pa?

(A) $5\frac{Kg}{m^3}$ (B) $0.2\frac{Kg}{m^3}$ (C) $0.5\frac{Kg}{m^3}$ (D) $2\frac{Kg}{m^3}$

7. The first law of thermodynamics takes the form ΔQ=ΔW, this equation is valid if the process is

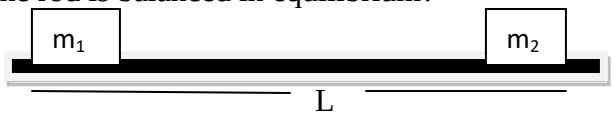
(A) Isobaric (B) Isochoric (C) Isothermal (D) Adiabatic

8. The diagram 1 below shows the horizontal forces on a 20.0 kg mass. The forces are constant in time. If the mass starts from rest, how far has it travelled in the horizontal direction after 3 second?



(A) 4.50 m (B) 6.75 m (C) 9.00 m (D) 25.5 m

9. A light rod has masses attached to each end, as shown in the diagram 2 below. At what distance from mass m_1 will the rod is balanced in equilibrium?



(A) $\frac{L(m_1+m_2)}{2(m_1+m_2)}$ (B) $\frac{m_2L}{m_1+m_2}$ (C) $\frac{m_1L}{m_1+m_2}$ (D) $\frac{L}{2}$

10. The period of oscillation of particle undergoing simple harmonic motion is

(A) Dependent of amplitude of oscillation

(B) Directly proportional to frequency of oscillation

(C) Dependent of gravity (g) and spring constant (K) of oscillation

(D) Independent of mass (m) and length (l) of oscillating object

11. A pipe, 50cm long is open at one end closed at other. When air is blow across the open end sound is produced at 200Hz. What is the velocity of sound along the pipe?

(A) 400m/se (B) 800m/se (C) 300m/se (D) 600m/se

12. The position of particle moving with simple harmonic motion is given by the expression X=4cos (ωt−ϕ), where (amplitude in meter, t=7T/4 is time, ω=2rad/se is angular frequency &ϕ=3π/2 is phase constant). Which one is **NOT CORRECT** about the particle's position, velocity, acceleration, and kinetic energy?

(A) Position and amplitudes are equal (C) Acceleration of the particle is positive

(B) Velocity of the particle is zero (D) Kinetic energy of the particle is 8kJ

13. In young's double slit experiment, if the slit separation is 0.8mm and the average spacing of the bright fringe observed on screen placed 4m away from the source is 2mm. what is the wave length of the light source?

(A) 450nm (B) 200nm (C) 600nm (D) 400nm

14. Two projectiles are launched from ground level with the same initial speed. The maximum height h_1 reached by projectile 1 is twice the maximum height h_2 reached by projectile 2. If θ_1 and θ_2 denote the respective launch angles, as measured from the horizontal, these angles satisfy which of the following relationships?

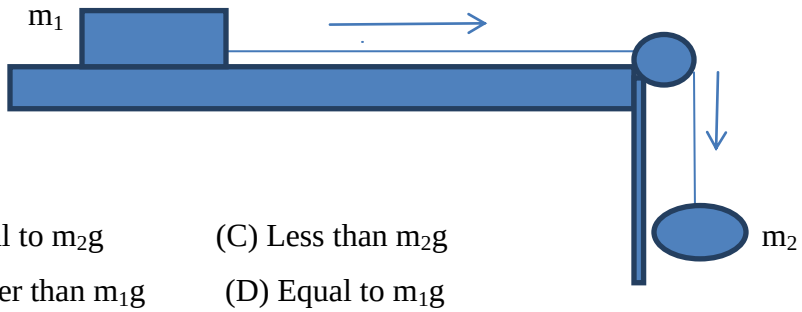
(A) $\cos\theta_1 = \sqrt{2}\cos\theta_2$ (C) $\tan\theta_1 = \sqrt{2}\tan\theta_2$

(B) $\sin\theta_1 = \sqrt{2}\sin\theta_2$ (D) $\sin\theta_1 = 2\sin\theta_2$

15. A 10kg box slides horizontally without friction at a speed of 1m/s.at one point, a constant force is applied to the box in the direction of its motion. The box travels 5m with the constant force applied. The force is the then removed, leaving the box with a speed of 2m/s. which of the following gives the magnitude of the applied force?

(A) 1N (B) 2N (C) 3N (D) 4N

16. A block with mass m_1 that slides on a frictionless table is attached by a massless string over a massless, frictionless pulley to a hanging ball with mass m_2, as shown in the figure 3 below. The tension in the string must be____



(A) Equal to m_2g (C) Less than m_2g

(B) Greater than m_1g (D) Equal to m_1g

17. The driver of a 1000-kg car wants to safely go on an unbanked curve of radius 100 m safely. If the coefficient of friction is $\mu = 0.1$, about how fast can he take the curve without sliding (in m/s)?

(A) 3 (B) 10 (C) 31 (D) 1

18. All are inversely proportional with distance [r=d] in electrostatics **EXCEPT** one:-

(A) Electric field strength (C) Work done by test charge

(B) Potential difference (voltage) (D) Capacitance between the two plates

19. Two –ve point charges are 2m apart & repeal each other with the force of 40N. When the distance between the charge is doubled, the new force between them is

(A) 20N (B) 40N (C) 10N (D) 80N

20. An object having net charge of 40μC is placed in a uniform electric field of 20N/C directed vertically. What is the mass of the object if it floats in this electric field?

(A) 8mg (B) 80mg (C) 0.8g (D) 80g

21. Two charges Q1= $-4X10^{-9}$C and Q2= $6X10^{-9}$C are separated in air at a distance of 2cm. how much electrostatic potential is produced by the two charges at mid distance between them?

(A) 1.8kV (B) 9kV (C) 1.2kV (D) 18kV

22. A horizontal pipe has a diameter of 10.0 cm. Fluid flows in the pipe at 1 m/s. The pipe is attached to a smaller pipe that has a diameter of 4.00 cm. What is the speed of the fluid in the smaller pipe?

(A) 0.200 m/s (B) 1.25 m/s (C) 6.25 m/s (D) 12.5 m/s

23. 12. A ball of mass m is suspended at the end of a mass less string of length L of pendulum. This pendulum is lifted to a 45° angle with the vertical and released. At the low point of its swing, the kinetic energy of the ball is____

(A) $m\sqrt{\frac{gL}{4}}$ (B) $m\sqrt{\frac{gL}{2}}$ (C) $m\sqrt{\frac{gL}{2}(1-\frac{\sqrt{2}}{2})}$ (D) mgL

24. 13. A mass is pulled 5 m across a smooth, horizontal surface by a force of magnitude 12N. The force acts at an angle of 60° with the horizontal. What is the work done by the force?

(A) 24 J (B) 60 J (C) 52 J (D) 30 J

25. Which of the following is **NOT TRUE** about parallel plate capacitor?

(A) Field between two oppositely charged parallel plates is uniform, means the field lines have equal spaced between the plates.

(B) As the plates have an equal but opposite charges, they mutually attract and hold each other together by creating electrostatic equilibrium.

(C) Work done on the surface of enclosed charge is zero because the field line and the surface of the plate are perpendicular to each other's.

(D) There is no any clear expiation about the two parallel plates except about the two unlike charges store on the plates

26. When a potential difference of 20V is applied to parallel plate capacitor that have $4cm^2$ cross-sectional area, separated at 8.85cm from each other's after dielectric constant (ε_0 =2) inserted. What is the total electric potential that can be stored by the plates of the capacitors?

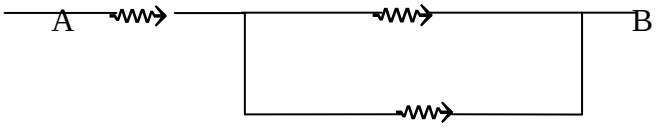
(A) 4 X 10^{-16}J (B) 8 X 10^{-14} J (C) 16 X 10^{-12} J (D) 12 X 10^{-14} J

27. A 10μF capacitor is discharged through 10000 Ω resistance. How long will it take for the charge across the capacitor to fall to 25% of its initial value?

(A) 7se (B) 1.4se (C) 14se (D) 0.7se

28. Three resistors each have 100Ω resistance are connected as shown on fig 4 blow. When maximum power that can deliver to any one of the restores is 25watt and current entering from junction is 2A, what is the current I and voltage V drops on each parallel resistor respectively**?**

(A) 1A and 100V (B) 2A and 300V (C) 1A and 200V (D) 2A and 200V



29. An object of mass M is set in a vertical circular motion. Tension T from the rope keeps the object in a circular path with speed V. Where does the rope experience a minimum tension?

(A) At the bottom of a circle (C) At the top of a circle

(B) When the object is at half of the circle (D) When it is at 45^0 is the vertical

30. Air bags help reduces injury in automobile accidents by:

(A) Reducing the time of collision. (C) Reducing the change in momentum

(B) Increasing the applied force (D) Increasing the time that force is applied

31. Consider a Hollow sphere, disc and solid sphere the entire radius starts from rest and roll down without slipping from the top of an inclined plane at the same time. What is the order in which they reach the bottom?

(A) Hollow sphere, disc then solid sphere (C) Disc, Hollow sphere then solid sphere

(B) Solid sphere, disc then Hollow sphere (D) Solid sphere, Hollow sphere then disc

32. As an ice skater begins a spin, her angular speed is 5rad/s. After pulling in her arms, her angular speed increases to 7 rad/s. what is the ratio of the skater's initial moment of inertia to her final moment of inertia?

(A) 5:3 (B) 7:5 (C) 5:7 (D) 3:5

33. Two resistors connected in series have an equivalent resistance of 7Ω. When they are connected in parallel, their equivalent resistance is 12/7 Ω. What is the resistance of each resistor?

(A) 5.5 Ω, 1.5 Ω (B) 4 Ω, 3Ω (C) 5 Ω, 2 Ω (D) 6Ω, 1 Ω

34. Galvanometer may be used as voltmeter by

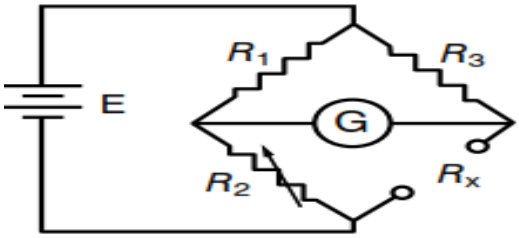
(A) Shunting the Galvanometer with high resistance

(B) Connecting low resistance in parallel with the Galvanometer

(C) Connecting it to a high resistance in series

(D) Connecting it to a low resistance in series

35. A Wheatstone bridge circuit is shown on the diagram 5 below and the value of $R_1 = 3\Omega$, $R_2 = 5\Omega$ and $R_3 = 6\Omega$ are given to limit the current in the galvanometer. What is the value of $\mathbf{R_x}$ to balance the bridge?



(A) 2.5 Ω

(B) 10Ω

(C) 3.6 Ω

(D) 14 Ω

36. The necessary and sufficient condition for a rigid body to be in equilibrium is the sum of

(A) All torque acting on it is zero

(B) All forces acting on it is zero

(C) All force should be equal in magnitude

(D) All force and the sum of all torque should be zero

37. The buoyant force on a block of wood floating in water

(A) Is equal to the weight of a volume of water with the same volume as the wood.

(B) Is equal to the weight of the wood.

(C) Is greater than the weight of the wood.

(D) Cannot be calculated because the block is not completely submerged.

38. Bernoulli's principle explains why

(A) A hot air balloon rises

(B) Airplanes fly.

(C) Liquid rises in a drinking straw.

(D) Dead fish float.

39. When you touch a piece of metal and a piece of wood at the same time and that are placed in the same room, the piece of metal feels much colder than the piece of wood. This happens because of the difference in:

(A) Specific heat

(B) Thermal conductivity

(C) Temperature

(D) Density

40. An electron moving at speed of $1.6X\ 10^7$ m/se inters a region of uniform magnetic field of magnitude $9X10^{-3}$ T, in a direction perpendicular to the field. The path followed by the electron is circular. What is the radius of circular path?

(A) 1cm (B) 4cm (C) 3cm (D) 2cm

41. What is the centripetal acceleration of an electron charge moving in a uniform magnetic field of 9nT on a circle of radius 2cm, if magnetic field is perpendicular to particle's direction of its motion?

(A) $5.12\ X\ 10^4\ m/se^2$ (B) $5.12\ X\ 10^{-4}\ m/se^2$ (C) $2.56\ X\ 10^4\ m/se^2$ (D) $2.56\ X\ 10^{-4}\ m/se^2$

42. A rectangular loop of area $0.4m^2$ is placed in a magnetic field that is changing at a rate of 200T/se. if the normal of the loop makes angle 60^0 with the magnetic field, what is the magnitude of induced electromotive force?

(A) 20V (B) 80V (C) 34V (D) 40V

43. Long wires of 10m in a length carry a current of 2A & 3A in the same direction. The wires are separated by 4cm. what is the magnetic force that the wire exerted on each other?

(A) 200μN repulsive force (C) 5 00μN repulsive force

(B) 300μN attractive force (D) 4 00μN attractive force

44. The coordinate of the particle in meter is given by $x=48t-4t^3$, where t is in second. At what value of t will the particle become momentarily at rest?

(A) 0se (B) 4se (C) 2se (D) $2\sqrt{2}$se

45. Reactance in the circuit matches the resistance. What is the inductance of an LC circuit that oscillates at 120Hz when the capacitance is 8μF?

(A) 22μH (B) 0.22H (C) 2.19H (D) 2.19μH

46. Which statement is correct about **pure capacitive** circuit?

(A) The current lead the voltage by 90°

(B) The current is in phase with the voltage by 90°

(C) The current lags by 90° at low frequency

(D) The current lags behind the voltage by 90°

47. In LRC series circuit, suppose R=45 Ω, Z=75 Ω, X_C=40 Ω, V_{rms} =210V & ω=200rad/se. which one is **NOT CORRECT** about RLC series circuit?

(A) The circuit is predominantly inductive

(B) Inductance is 0.5H and Capacitor is 125 μF

(C) Root square mean current is 2A

(D) Power factor is 0.6 and average power is 353W

48. When the radioactive element ^{226}**Ra** decays to ^{222}**Rn**, which one is **NOT CORRECT** about the decay process?

(A) An alpha particle is emitted during the decay process

(B) The daughter nucleus has two protons more than the parent nucleus

(C) The daughter nucleus has two protons less than the parent nucleus.

(D) The atomic mass of parent nuclei is more than daughter nuclei by four

49. The activity of radioactive substance is reduces from 4000 Bq to 1000 Bq in 10^6 se. what is the decay constant?

(A) 6.93 X 10^7 decay /se

(B) 6.93 X 10^{-7} decay /se

(C) 1.386 X 10^6 decay /se

(D) 1.386 X 10^{-6} decay /se

50. The half-life of radium 224 is 3.5 days. What percentage fractions of the sample remain after 14 days?

(A) 50% (B) 25% (C) 6.25% (D) 12.5%