LIDETA SUB CITY ADMINISTRATION EDUCATION OFFICE GRADE 12 PHYSICS MODEL EXAMINATIONS 2017E.C/ 2025G.C NUMBER OF QUESTIONS: 60

TIME ALLOWED: - 2:30 HOURS

GENERAL DIRECTIONS THIS BOOKLET CONTAINS EXAMINATION PHYSICS. IN THIS EXAMINATION, THERE ARE A TOTAL OF 60 MULTIPLE CHOICE QUESTIONS. CAREFULLY SELECT THE BEST ANSWER AND BLACKEN ONLY THE LETTER OF YOUR CHOICE ON THE SEPARATE ANSWER SHEET PROVIDED. FOLLOW THE INSTRUCTIONS 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 OFYOUR 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 UNTIL YOU ARE TOLD TO DO SO

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

Constant	**Symbol**	**Value**
Acceleration due to gravity	g	$10m/s^2$
Universal Gravitational Constant	G	$6.67x10^{-11}Nm^2/lkg^2$
Density of water	ρ	$1000\ kg/m^3$
$\sin 30^0 = \cos 60^0 = 0.5$	$\sin 60^0 = \cos 30^0 = 0.87$	
$\sin 37^0 = \cos 53^0 = 0.6$	$\sin 53^0 = \cos 37^0 = 0.8$	

DIRECTION: 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.

1. Which of the following best illustrates the difference between vector and scalar quantities?
   A) A vector has magnitude only, while a scalar has direction.
   B) A vector has direction only, while a scalar has both magnitude and direction.
   C) A vector has both magnitude and direction, while a scalar has only magnitude.
   D) Both have direction and magnitude.
2. If vector A is 8 units to the right and vector B is 3 units to the left, what is the resultant vector?
   A) 5 units to the left
   C) 11 units to the left
   B) 11 units to the right
   D) 5 units to the right
3. Two forces, one of 40 N and the other of 30 N, act on a body at an angle of 90°. Find the resultant force.
   A) 70 N B) 50 N C) 10 N D) 35 N
4. A state of balance where no unbalanced forces act on a body is called:
   A) Resolving
   C) Resultant
   B) Momentum
   D) Equilibrium

5. Which of the following defines acceleration?

   A) The rate of change of displacement

   B) The rate of change of distance

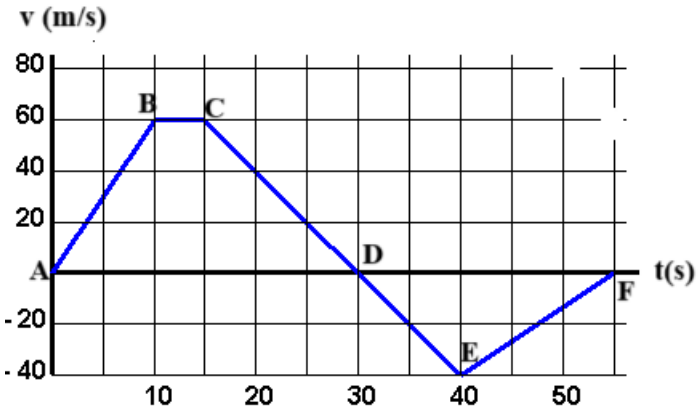
   C) The rate of change of speed

   D) The rate of change of velocity

6. A car travels a distance of 150 m while accelerating from 10 m/s to 30 m/s. What is the time taken for this acceleration?

   A) 10 s B) 5 s C) 7.5 s D) 12 s

7. Which of the following statements is true about a velocity-time graph shown below?



   A) The object moves with zero acceleration for 10 seconds.

   B) In the interval CD, the object decelerates at 2 m/s².

   C) In the interval DE, the object accelerates in the opposite direction.

   D) The average velocity in the first 10 seconds is 60 m/s.

8. Which equation gives the final velocity of an object in terms of initial velocity, acceleration, and time in uniformly accelerated motion?

   $A)\ s = ut + \frac{1}{2}at^2$ $C)\ V^2 = u^2 + 2as$

   $B)\ s = \left(\frac{v+V}{2}\right)t$ $D)\ V = u + at$

9. What is relative motion in the context of physics?
   A) The movement of an object in a straight path.
   B) Motion observed from one object's frame of reference.
   C) The distance traveled by an object.
   D) The speed of an object.
10. If the mass of an object is doubled while the net force acting on it remains the same, what happens to its acceleration?
   A) It doubles.
   B) It halves.
   C) It remains the same.
   D) It quadruples.
11. Which of the following scenarios does NOT demonstrate Newton's Third Law of Motion?
   A) A person walks on the ground.
   B) A leaf falls from a tree.
   C) A fish swims by pushing water backward.
   D) A rocket coasts in space with thrust.
12. The product of an object's mass and velocity is:
   A) Inertia
   B) Linear momentum
   C) Mechanical work
   D) Linear speed
13. In a head-on elastic collision between two cars, if Car A is twice as heavy as Car B, what happens to their velocities after the collision?
   A) Car A moves slower than Car B.
   B) Car A moves faster than Car B.
   C) Both cars come to a stop.
   D) Car A and Car B have the same speed.
14. How does momentum conservation influence vehicle safety design?
   A) It complicates safety designs unnecessarily.
   B) It is only a theoretical concept.
   C) It is irrelevant to safety features.
   D) It significantly influences crumple zone designs.
15. Which of the following best describes an elastic collision?
   A) Only momentum is conserved.
   B) Kinetic energy is lost, but momentum is conserved.

C) Both momentum and kinetic energy are conserved.

D) Kinetic energy is conserved, but momentum is lost.

16. What does the first condition of equilibrium state?

A) The sum of all moments must be zero.

B) The sum of all forces must be zero.

C) The object must be in motion.

D) The sum of all forces must equal the object's mass.

17. The amount of energy transferred by a force acting through a displacement is called:

A) Mechanical power

B) Energy

C) Momentum

D) Mechanical work

18. Which of the following describes the work-energy principle?

A) Work and energy are unrelated.

B) Energy cannot be created but can be destroyed.

C) Work done is equal to the change in kinetic energy.

D) Work is done only when an object moves.

19. How does energy conservation reduce climate change impacts?

A) It has no impact on climate change.

B) It increases energy use.

C) It can help reduce greenhouse gas emissions.

D) It creates more waste.

20. What is the relationship between power and work done over time?

A) Power decreases as work increases.

B) Power is equal to work done divided by time.

C) Power has no relation to work.

D) Power is directly proportional to the time taken.

21. How does gravitational potential energy influence the power needed to lift an object quickly?

A) Greater potential energy requires more power to lift quickly.

B) Power is independent of potential energy.

C) Power decreases as potential energy decreases.

D) Higher potential energy means less power is needed.

22. Which of the following is a key reason why physics is important to society?
    A) It is a basic science of all sciences.
    B) It generates the fundamental knowledge needed for technological advances.
    C) It gives the answers for all problems of the society.
    D) It focuses solely on societal challenges.
23. Which of the following statements does not correctly describe physics communities and their roles?
    A) Physics communities facilitate collaboration and knowledge sharing among physicists.
    B) They focus exclusively on theoretical physics without engaging in practical applications.
    C) These communities promote interest in physics through educational outreach and events.
    D) Physics communities provide networking opportunities for professional development.

24. The scientific knowledge is constructed by _____.
    A) solely relying on a priori knowledge, which is derived from reason and logic independent of experience.
    B) primarily using testimony and accepting information from trusted sources without further investigation.
    C) a combination of a posteriori knowledge gained through observation and experience, and a priori knowledge derived through reason and logic.
    D) exclusively depending on introspection and analyzing one's own thoughts, feelings, and emotions.

25. Which of the following choices all contain job opportunities for studying physics?
    A) Astrophysicist, Medical Physicist, Data Analyst, Nuclear Physicist
    B) Research Scientist, Software Developer, Meteorologist, Financial Analyst
    C) Engineer, Geophysicist, Environmental Scientist, Technical Consultant
    D) All of the above

26. Which of the following pairs of vector types and their definitions is correctly matched?
    A) Collinear vectors - Vectors that are parallel to the same line irrespective of their magnitudes and direction.
    B) Parallel vectors - Vectors that lie in the same plane or parallel to the same plane.
    C) Co-planar vectors - Vectors that are perpendicular to one another.
    D) Orthogonal vectors - Vectors that are in the same direction.
27. Which one of the following correctly explain the geometric method for addition and subtraction of vectors in a plane?
    A) Vectors are added by drawing them from their tails in any direction. Subtraction is performed by measuring the lengths of the vectors and adjusting for angles.
    B) Vectors can only be added by using their components, while subtraction can be done by simply reversing the vectors and adding their lengths.
    C) Vectors are added by aligning their tails at a common point and measuring the angles formed. Subtraction involves drawing a line from the head of the first vector to the tail of the second.
    D) Vectors can be added by placing them head to tail and drawing a vector from the tail of the first to the head of the last. Subtraction is done by reversing the direction of the vector to be subtracted and then adding it to the first vector.
28. Which one of the following vector inequalities is not correct?

    A. $|\vec{A}+\vec{B}| \leq |\vec{A}| + |\vec{B}|$
    C. $|\vec{A} - \vec{B}| \leq |\vec{A}| + |\vec{B}|$
    B. $|\vec{A}+\vec{B}| \geq |\vec{A}| - |\vec{B}|$
    D. $|\vec{A} - \vec{B}| \leq |\vec{A}| - |\vec{B}|$

29. Two vectors, A and B, are represented graphically in a coordinate system. Vector A is 3 units long at an angle of 37° from the positive x-axis, while vector B is 4 units long at an angle of 127° from the positive x-axis. What is the magnitude of the sum of the vectors A and B?

    A) 7.0 units B) 5.0 units C) 4.5 units D) 1.0 unit

30. For two vectors $\vec{A}$ and $\vec{B}$; $\vec{A}-\vec{B}=\hat{i}+10j$ and $\vec{A}+\vec{B}=5i+12j$, which one of the following is true?

A) $\vec{A}\cdot\vec{B}=6$

B) $\left|\vec{A}\right|=4$

C. The unit vector in the direction of $\vec{A}+\vec{B}$ is $\frac{5}{13}\hat{i}+\frac{12}{13}j$

D. $\left|\vec{B}\right|=\frac{2}{3}\left|\vec{A}\right|$

31. The magnitude of the dot product of a vector with itself is always:

A. Zero.

B. One.

C. The square of the magnitude of the vector.

D. Dependent on the vector's direction.

32. A car travels on a straight road. It accelerates from rest to 20 m/s in 10 seconds, maintains that speed for another 10 seconds, and then decelerates to rest in a further 5 seconds.

I. The average velocity for the entire journey is 12 m/s.

II. The instantaneous velocity at the 15-second mark is 20 m/s.

III. The total distance travelled is 300 m.

IV. The deceleration during the motion is -4m/s^2.

Which of the above statements is/are true?

A) II and IV

B) I and III

C) II and III

D) I, II and IV

33. Which of the statements, about average velocity and instantaneous velocity is correct?

A) If an object is travelling with constant velocity, then its instantaneous velocity is larger than its average velocity.

B) If an object is travelling with constant velocity, then its average velocity is larger than its instantaneous velocity.

C) The velocity of the object at a point is instantaneous velocity, whereas the ratio of the displacement to the time required to travel the displacement is average velocity.

D) The velocity of an object at a point is the average velocity, whereas the displacement divided by the time required to travel the displacement is the instantaneous velocity.

34. A car traveling at a constant acceleration covers the distance between two points 180m apart in 6.0sec. If the speed of the car at the second point is 45m/s, what is the acceleration of the car?

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

35. The velocity-time graph of a car shows a straight line with a positive slope. Which statement accurately describes the motion of the car?

A. The car is accelerating uniformly in the positive direction

B. The car is moving with a constant velocity.

C. The car is decelerating uniformly in the positive direction.

D. The car is at rest, as the slope of the graph is positive.

36. Suppose two stones, A and B, are thrown with the same velocity vertically upward but A on Earth and B on moon. Which ball stays longer in air?

A) Stone A C. Both stones stay for the same time

B. Stone B D. Impossible to know

37. Which of the following best describes uniform circular motion?

A) An object moves in a circular path with a constant velocity.

B) An object moves in a straight line with a constant speed.

C) An object moves in a circular path with a constant speed but changing velocity.

D) An object moves in a circular path with varying speed and varying velocity.

38. Which of the following statements best explains the relationship between force and motion?

A) A force is required to keep an object moving at a constant velocity.

B) Motion cannot occur without the continuous application of force.

C) Force sustains motion and increases the velocity of the object.

D) An object continues to move at a constant velocity unless acted upon by an external force.

39. Which of the following factors affects the magnitude of the force of friction between two surfaces?

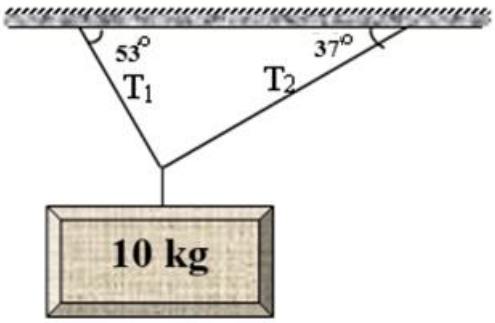
A) The normal force pressing the two surfaces together.

B) The surface area of contact between the two surfaces.

C) The relative velocity between the two surfaces.

D) The temperature of the surfaces.

40. A block of mass 10 kg is suspended by two ropes as shown in the diagram. What is the tension in rope 1 (T_1)?



A) 40 N

B) 60 N

C) 80 N

D) 100 N

41. Which of the following statements BEST distinguishes between conservative and non-conservative forces?

A) Work done by a conservative force along any closed path is zero, whereas the work done by non-conservative force along a closed path is not zero.

B) Work done by conservative force is path dependent, whereas work done by non-conservative force does not depend on the path followed.

C) Friction force is an example of conservative force, whereas spring force and gravitational forces are examples of non-conservative forces.

D) A conservative force dissipates energy, whereas a non-conservative force does not.

42. A pendulum is released from a height of 5 m above its lowest point. At what point in the swing will the pendulum have its maximum kinetic energy?

A) At the highest point on either side

B) Halfway down

C) At the lowest point

D) At three-quarters of the way down

43. How does fluid dynamics help to explain circulation in multicellular organisms?

A) By understanding pressure differentials and flow rates in blood vessels

B) By analyzing the chemical composition of blood

C) By studying sound wave propagation in the body

D) By examining the electrical signals in neurons.

44. Which of the following concepts from physics is MOST fundamental to the design and analysis of electrical motors, generators, and transformers?
    A) Optics and heat transfer
    B) Newtonian mechanics and laws of motion
    C) Fluid mechanics and fluid dynamics
    D) Electromagnetism and electromagnetic induction

45. What type of electromagnetic radiation is used in night vision technology for defense activity?
    A) Infrared radiation
    B) Visible light
    C) Radio waves
    D) Ultraviolet radiation

46. Which physics principle is most fundamental to the operation of radio, television, and wireless networks?
    A) Electrostatics and current electricity
    B) Electromagnetism and electromagnetic wave propagation
    C) Newtonian mechanics and laws of motion
    D) Sound wave and light wave

47. Wireless communication systems like mobile networks, Wi-Fi, and Bluetooth rely most heavily on which aspect of physics?
    A) Principles of acoustic wave propagation and sound transmission.
    B) Principles related to electromagnetic wave transmission and reception.
    C) Principles of microwave and millimeter-wave technology.
    D) Principles of antenna theory.

48. A projectile is launched at an angle. At the highest point of its trajectory, which of the following is true about the horizontal velocity, vertical velocity, and acceleration?
    A) The horizontal velocity is zero, the vertical velocity is zero, and the acceleration is zero.
    B) The horizontal velocity is zero, the vertical velocity is at its maximum, and the acceleration is g (downward).

C) The horizontal velocity is constant, the vertical velocity is zero, and the acceleration is g (downward).

D) The horizontal velocity is at its maximum, the vertical velocity is at its maximum, and the acceleration is zero.

49. A ball is thrown from the top of one building towards another tall building with a velocity of 20m/s at 37^{o} above the horizontal. The two walls are 50m apart. How far above or below the throwing level will the ball strike the opposite wall?

A) 11.3 m above the throwing level
C) 88.6 m above the throwing level
B) 11.3 m below the throwing level
D) 88.6 m below the throwing level

50. Which of the following statements is true about the motion of a rigid object about a fixed axis?

A) The acceleration of all points in the object is the same.

B) The velocity of points nearer the axis of rotation is larger than the velocity far from the axis of rotation.

C) All points in the object rotate with the same angular velocity.

D) The moment of inertia is constant regardless of the axis of rotation.

51. Starting from rest a body is rotated in a circle of radius 50cm with an angular acceleration of 2rad/s^2. What is the tangential velocity after 10sec?

A) 2 m/s B) 5 m/s C) 7.5 m/s D) 10 m/s

52. According to Kepler's Second Law (Law of Equal Areas), what happens as a planet moves closer to the Sun in its elliptical orbit?

A) Its speed decreases and its period of revolution increases.

B) Its speed increases and its period of revolution decreases.

C) Its speed remains constant and its period of revolution varies.

D) Its speed decreases while its period of revolution remains constant.

53. A newly discovered planet orbits its star at a distance 4 times greater than the Earth's distance from the Sun. How many Earth years does it take for this planet to complete one orbit?

A) 2 years B) 4 years C) 8 years D) 16 years

54. If a person moves to a height equal to the radius of the Earth above the surface, how does the acceleration due to gravity change compared to its value on the surface?

A) It becomes one-fourth.
C) It becomes half.
B) It remains the same.
D) It becomes zero.

55. How does Newton's universal law of gravitation support Kepler's third law?

A) It shows that gravitational force varies with the distance between the Sun and the planets.
B) It demonstrates that the force of gravity acts equally on all planets, regardless of their distance from the Sun.
C) It indicates that the mass of the Sun determines the gravitational force affecting planetary motion.
D) It establishes that the square of the orbital period is proportional to the cube of the semi-major axis of the orbit.

56. If the distance between two objects is reduced to one-third of its original value, how does the gravitational force change according to Newton's law of universal gravitation?

A) It becomes one-third of the original force.
B) It becomes nine times greater.
C) It becomes three times greater.
D) It becomes one-ninth of the original force.

57. What is the primary cause of pressure in a gas?

A) The weight of the gas
B) The attraction between gas molecules
C) The collisions of gas particles with the walls of the container
D) The temperature of the container

58. Which of the following correctly defines absolute pressure?

A) Absolute pressure is the pressure relative to a perfect vacuum (zero pressure).
B) Absolute pressure is the pressure relative to the local atmospheric pressure.
C) Absolute pressure is the pressure exerted by the weight of the atmosphere.
D) Absolute pressure is the difference between the system pressure and atmospheric pressure.

59. Why does the thickness of a dam generally increase with depth?

A) To accommodate more volume of water.

B) To counteract the increasing water pressure exerted on the dam at greater depths.

C) To provide a wider base for easier construction and maintenance access.

D) To allow for future expansion of the reservoir's capacity.

60. A hydraulic press has a small piston with a radius of 0.05 m and a large piston with a radius of 0.15 m. If a force of 100 N is applied to the small piston, how high will the large piston rise if the small piston is pushed down by 20 cm?

A) 6 cm B) 12 cm C) 1.1 cm D) 2.2 cm