OROMIA EDUCATION BURAEU

2017/2025 PHYSICS FIRST SEMESTER MODEL EXAMINATION FOR GRADE 12

TIME ALLOWED: 3:00 HOURS

GENERAL DIRECTIONS:

I. FOLLOW THE FOLLOWING RULES AND REGULATIONS IN DOING THE EXAMINATION.

- THE EAMINATION CONSISTS OF **70 MULTIPLE CHOICE** QUESTIONS.
- WRITE AND FEED (FILL) YOUR NAME THE SUBJECT CODE, BOOKLET CODE ON THE SEPARATE ANSWER SHEET PROVIDED.
- SELECT ONLY THE **CORRECT (BEST)** ANSWER FOR EACH QUESTION
- USE ONLY **PENCIL** TO MARK YOUR ANSWERS.
- **BLACKEN** ONLY THE LETTER OF YOUR CHOICE IN LINE WITH THE BOX ON THE SEPARATE ANSWER SHEET PROVIDED.
- ERASE ALL UNNECESSARY MARKS COMPLETELY FROM THE ANSWER SHEET.
- ANY FORM OF CHEATING IS PROHIBITED.
- YOU MUST IMMEDIATELY STOP WORKING WHEN TIME IS OVER.
- FOLLOW FURTHER INSTRUCTIONS ON THE BOOKLET FOR EACH QUESTION.

II. ATTENTION

MAKE SURE THAT YOU HAVE WRITTEN ALL THE REQUIRED INFORMATION ON THE SEPARATE ANSWER SHEET CORRECTLY BEFORE YOU RETURN IT.

DO NOT TURN THIS PAGE OVER UNTIL YOU ARE TOLD TO DO SO.

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

Name of Constants	**Symbol**	**Value**
Acceleration due to gravity	g	$10\ m/s^2$
Permittivity of vacuum	$\mathcal{E}_0$	8.85×10^{12} F/m
Charge of an electron	e^-	1.6×10^{-19} C
Universal gravitational constant	G	$6.67 \times 10^{11}\ Nm^2/kg^2$
Electrostatic constant	K	$9 \times 10^9\ Nm^2/C^2$
Density of Water	ρ_w	$1000\ kg/m^3$
Atmospheric Pressure	P_{atm}	1.013×10^5 Pa
Mass of the earth	M_e	6×10^{24} Kg
Radius of the earth	r_e	6480 km
Mass of Electron	m_{e-}	9.11×10^{-31} Kg
Specific heat capacity of ice	c_{ice}	$2.1\ J/g°C = 2100 J/kg^0C$
latent heat of fusion of ice	L_f	334 J/g = 334,000J/kg
Coefficient of linear expansion of iron	α_{iron}	$1.1 \times 10^{-5}/k$
Planck's Constant	h	6.63×10^{-34} J.s
$\sin 30^0 = \cos 60^0 = 0.5$		
$\sin 37^0 = \cos 53^0 = 0.6$		
$\sin 45^0 = \cos 45^0 = 0707$		
$\sin 53^0 = \cos 37^0 = 0.8$		
$\sin 60^0 = \cos 30^0 = 0.87$		

1. Which of the following best describes the role of physics in technological advancements?
    A. Physics has no impact on technology.
    B. Physics only affects theoretical research, not practical applications.
    C. Physics is only important for understanding natural phenomena.
    D. Physics provides the fundamental principles that drive technological innovations.
2. In which step of the scientific method you give meanings to the data obtained?
    A. Analysis
    B. Conclusion
    C. Question
    D. Hypothesis
3. How does scientific knowledge differ from personal beliefs?
    A. Scientific knowledge is subjective, while personal beliefs are objective.
    B. Scientific knowledge is always correct, while personal beliefs are always incorrect.
    C. Scientific knowledge is based on intuition or opinion, while personal beliefs are based on logic.
    D. Scientific knowledge is based on empirical evidence and systematic investigation, while personal beliefs are based on individual experiences and opinions.
4. Which one of the following is **NOT** among the major **new** discoveries in the field of Physics?
    A. Exoplanets
    B. The sun
    C. Quantum cryptography
    D. High energy physics,
5. Which of the following best describes **co-planar vectors**?
    A. lie in the same plane
    B. have the same magnitude
    C. have the same direction
    D. have the same initial point
6. Which of the following best describes a quantity of equal vectors?
    A. have the same magnitude but different directions
    B. have different magnitudes but the same direction
    C. have the same magnitude and direction
    D. have different magnitudes and directions

7. Suppose there are two vectors **A** and **B** which are perpendicular to each other. If vector **A** has a magnitude of 3 units and the resultant vector **R** has a magnitude of 5 units, then what is the magnitude of vector **B**?

   A. 2 units
   C. 5 units
   B. 4 units
   D. $\sqrt{34}$ units

8. Given three vectors, **A, B**, and **C,** with components **A**x = 3 units, **A**y = 4 units; **B**x = -2 units, **B**y = 1 unit, **C**x = 1 unit, and **C**y = -5 units, what is the magnitude of the resultant vector?

   A. 0 units
   C. 4 units
   B. 2 units
   D. 6 units

9. The unit vector in the direction of a vector 8i + 6j is:

   A. 1
   C. i + j
   B. 10
   D. 0.8i + 0.6j

10. What is the scalar product of vectors **C** and **D**, if **C** = 18i – 3j and **D** = 4j?

   A. 0
   C. -12
   B. 6
   D. 30

11. A body moves along a straight line, its distance from the origin at any instant being given by the equation: $X = 4t - t^2$, where X is in meter and t is in seconds. What is the average velocity of the body in 3s?

   A. 1m/s
   C. 5m/s
   B. 3m/s
   D. 12m/s

12. A car decelerates uniformly from a speed of 25 m/s to rest in 5 seconds. What is the distance traveled by the car during this time?

   A. 50 meters
   C. 75 meters
   B. 62.5 meters
   D. 100 meters

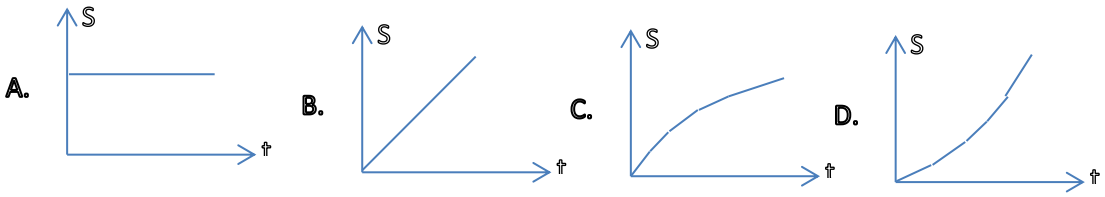
13. A car traveling at 20 m/s has a braking distance of 40 meters. If the car's speed is doubled, what will be the new braking distance, assuming the same deceleration?

   A. 40 m
   C. 160 m
   B. 80 m
   D. 320 m

14. A driver driving a car at 20 m/s sees a donkey 110 m ahead and applies the brake. If the reaction time of the driver is 3s and the car's deceleration is 5 m/s², will the car stop before hitting the donkey? (Hint: consider reaction distance and braking distance)

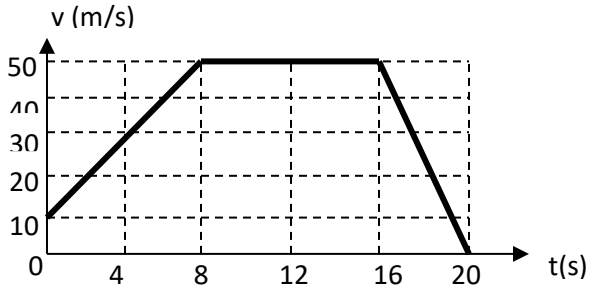
    A. Yes, the car will stop 10 meters before hitting the donkey.
    B. Yes, the car will stop 5 meters before hitting the donkey.
    C. No, the car will stop 5 meters after hitting the donkey.
    D. No, the car will stop 10 meters after hitting the donkey.

15. Which one of the following displacement-time graphs represents a uniformly accelerated motion with negative acceleration?



16. What is the total displacement covered by an object's motion represented by the velocity-time graph shown below?

    A. 320 m
    B. 500 m
    C. 740 m
    D. 1000 m



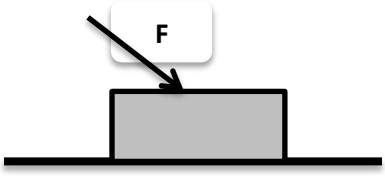
17. A ball is thrown vertically upward with an initial velocity of 15 m/s. What is its velocity after 2 seconds?

    A. 5 m/s upward
    B. 5 m/s downward
    C. 35 m/s upward
    D. 35 m/s downward

18. A cyclist is riding around a circular track with a radius of 30 m at a constant speed of 10 m/s. What is the centripetal force acting on the cyclist if the mass of the cyclist and the bicycle is 60 kg?

    A. 20 N
    B. 30 N
    C. 200 N
    D. 300 N

19. Which of the following best describes the relationship between weight and normal force for an object resting on a horizontal surface, if an external force **F** is acting as shown below?



A. Weight is greater than the normal force
B. Weight is equal to the normal force
C. Weight is less than the normal force
D. Weight is independent of the normal force

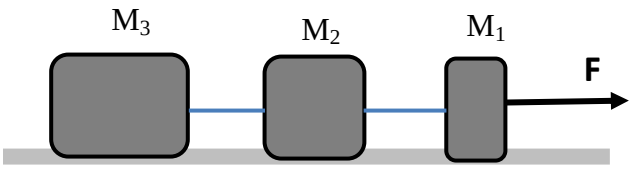
20. Three boxes are connected with massless light ropes and a horizontal pulling force **F** is exerted on the box of mass M_1 as shown in the figure below. If the coefficient of kinetic friction between each of the boxes and the horizontal floor is μ, which one is correct expression to calculate the acceleration of the system?

A. $a = \left(\frac{F}{M_1 + M_2 + M_3}\right) \mu g$

B. $a = \frac{F - \mu g}{M_1 + M_2 + M_3}$

C. $a = \frac{F}{M_1 + M_2 + M_3} + \mu g$

D. $a = \frac{F}{M_1 + M_2 + M_3} - \mu g$



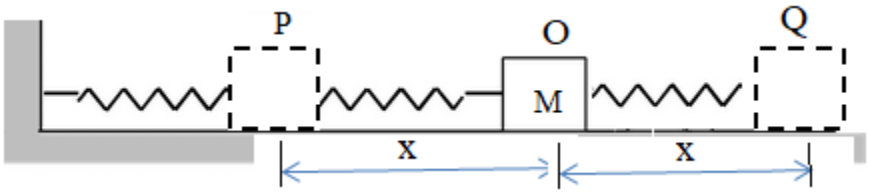
21. A block of mass 10kg rests on an inclined plane of inclination angle 37^0. What is the coefficient of static friction between the block and surface?

A. 0.58
B. 0.75
C. 0.80
D. 1.00

22. Two objects, one with a mass of 2 kg moving at 4 m/s due west and another with a mass of 4 kg moving at 1 m/s in the opposite direction, collide and stick together. What is their speed after the collision?

A. 0.67 m/s, East
B. 0.67 m/s, West
C. 2.0 m/s, East
D. 2.0 m/s, West

23. A block of mass ‘M’ is attached to spring of spring constant ‘K’, as shown in the figure below. If the mass is pushed to a point ‘P’, which is at a distance ‘x’ from the equilibrium position ‘O’, and released. As a result the mass swings between points ‘P’ and ‘Q’. Which one of the following statement is correct about kinetic energy (KE) and potential energy (PE) of the system after the release of the mass at point ‘P’? (Assume the surface is horizontal and frictionless surface)



A. At point P, the system will have both KE and PE.
B. At point Q, the system will have both KE and PE
C. At point O, the system will have both KE and PE.
D. At point P, the mass will attain maximum velocity.

24. A light weightless strong beam supported at its ends by two ropes is in equilibrium, If a 100 N weight is placed at the center of the beam, what will be the force exerted by each rope?

A. 25 N
B. 50 N
C. 75 N
D. 100 N

25. A car accelerates uniformly from rest to 20 m/s in 4 seconds. If the mass of the car is 1000 kg, what is the net force acting on the car?

A. 2000 N
B. 3000 N
C. 4000 N
D. 5000 N

26. Which of the following is an example of radiation?

A. Feeling the warmth of the sun.
B. Touching a hot stove
C. An air breath from a sea to the land.
D. A metal spoon getting hot when stirring hot soup.

27. Which of the following experimental setups would be best to measure the specific heat capacity of a metal object?
    A. Heating the object in a microwave oven and measuring the temperature change.
    B. Placing the object in a freezer and measuring the temperature change.
    C. Heating the object with a Bunsen burner and measuring the temperature change.
    D. Immersing the object in a known quantity of water at a known temperature and measuring the final temperature of the water.
28. The increase in length of a 2m iron wire heated from 10^0C to 30^0C is:
    A. 0.44mm
    B. 4.4mm
    C. 44m
    D. 440mm
29. Why do metal lids on glass jars often become easier to open after running hot water over them?
    A. The hot water lubricates the lid
    B. The metal lid expands more than the glass jar, loosening the lid
    C. The hot water dissolves any adhesive on the lid
    D. The hot water makes the glass jar contract
30. A 500 g block of ice at -10°C is heated until it completely melts and reaches 0°C. How much heat energy is required to achieve this?
    A. 10.5 KJ
    B. 167.0 KJ
    C. 177.5KJ
    D. 157.5 KJ
31. An experiment is conducted to determine the specific heat capacity of a liquid. A 500g sample of the liquid is placed in an insulated container and heated using an electric heater with a power output of 100 W. The heater is turned on for 300 seconds, and the temperature of the liquid increases by 10°C. What is the specific heat capacity of the liquid?
    A. 6.0 J/g°C
    B. 1.33 J/g°C
    C. 2.00 J/g°C
    D. 2.67 J/g°C

32. A square metal plate has an initial side length of 1 m and a coefficient of linear expansion of $2\times10^{-5}\ °C^{-1}$. If the temperature increases from 20^0C to 120°C, what is the change in area of the plate?

    A. 0.04 m^2 C. 0.004 m^2.

    B. 0.02 m^2 D. 0.002 m^2

33. Why are bimetallic strips used in thermostats?

    A. To measure temperature accurately

    B. To provide electrical insulation

    C. To convert thermal energy into electrical energy

    D. To bend and break the circuit when the temperature changes

34. Which of the following best describes the energy change during the phase transition from liquid to gas?

    A. Energy is absorbed C. Energy remains constant

    B. Energy is released D. Energy is destroyed

35. Which of the following statements correctly explains **Coulomb's law** using the idea of vectors? The electric force between two charges is a:

    A. scalar quantity that depends only on the magnitude of the charges.

    B. vector quantity that has both magnitude and direction, and it acts along the line joining the charges.

    C. scalar quantity that depends only on the distance between the charges.

    D. vector quantity that has both magnitude and direction, and it acts perpendicular to the line joining the charges.

36. Which of the following best describes the pattern of **electric field lines** between two opposite charges?

    A. The lines start from the positive charge and end at the negative charge

    B. The lines start from the negative charge and end at the positive charge

    C. The lines form concentric circles around each charge

    D. The lines form a spiral pattern around each charge

37. Two point charges, $q_1 = 3\ \mu C$ and $q_2 = -3\ \mu C$, are placed 0.5 meters apart. What is the electric potential at the midpoint between the charges?

A. 0 V
C. 2.16×10^5 V
B. 1.08×10^5 V
D. 3.24×10^5 V

38. Which of the following best defines an equipotential surface? A surface on which the electric:

A. field is the same at every point
C. potential is the same at every point
B. charge is the same at every point
D. force is the same at every point

39. Three resistors (10 Ω, 20 Ω, and 30 Ω) are connected in series. What is the equivalent resistance?

A. 5.5Ω
C. 30.0 Ω
B. 20.0 Ω
D. 60.0 Ω

40. Kirchhoff's Voltage Law states that:

A. The sum of voltages around any closed loop in a circuit is zero.
B. The resistance of a conductor is directly proportional to its length.
C. The sum of currents entering a junction is equal to the sum of currents leaving the junction.
D. The power dissipated in a resistor is equal to the square of the current times the resistance.

41. A parallel-plate capacitor has a plate area of 0.1 m^2 and a plate separation of 1 mm. If the permittivity of free space is 8.85×10^{-12} F/m, what is the capacitance?

A. 8.85×10^{-9} F
C. 8.85×10^{-11} F
B. 8.85×10^{-10} F
D. 8.85×10^{-15} F

42. Which of the following pairs represents isotopes of the same element?

A. ^{12}C and ^{14}N
C. ^{1}H and ^{2}H
B. ^{16}O and ^{18}O
D. All of the above

43. Radioactive dating is used to:

A. determine the age of rocks and fossils.
B. measure the intensity of a radioactive source.
C. detect the presence of radioactive materials.
D. treat cancer.

44. How is nuclear medicine used in medical diagnosis?

A. To detect and treat cancer
B. To diagnose heart conditions
C. To image internal organs
D. All of the above

45. What is the primary difference between nuclear fission and nuclear fusion?

A. Fission involves splitting a heavy nucleus, while fusion involves combining lighter nuclei.
B. Fission involves combining lighter nuclei, while fusion involves splitting a heavy nucleus.
C. Both processes involve splitting heavy nuclei.
D. Both processes involve combining lighter nuclei.

46. Which of the following is **NOT** a recommended protective measure against radiation exposure?

A. Minimizing exposure time.
B. Increasing the distance from the source.
C. Using shielding materials.
D. Increasing the intensity of the radiation source.

47. Which of the following particular area of study deals with the heavenly bodies?

A. Astronomy
B. Earth Science
C. Geology
D. Mineralogy

48. Which anatomical feature of cheetahs is **NOT/LEAST** contributing factor to their ability to reach high speeds?

A. Flexible spine
B. Long tail
C. Large ears
D. Strong leg muscle

49. What is the primary use of a stethoscope in medical diagnosis?

A. To listen to internal body sounds
B. To perform ultrasound scans
C. To measure blood pressure
D. To take X-ray images

50. Which one of the following Engineering field is concerned particularly in dealing with aircraft, watercraft, engines, robotics, weapons, cars, hydraulics and others?

A. Chemical
B. Civil
C. Electrical
D. Mechanical

51. Which of the following best describes the role of physics in the development of telecommunications?
    A. Physics helps in understanding the biological effects of radio waves.
    B. Physics provides the principles for the transmission of signals over long distances.
    C. Physics is used to design the aesthetic aspects of communication devices.
    D. Physics is irrelevant to telecommunications
52. A projectile is launched horizontally from a height of 20 meters with an initial speed of 10 m/s. How long does it take to hit the ground?
    A. 1 s
    B. 2s
    C. 2.5 s
    D. 4 s
53. A projectile is launched at an angle of 45^0 with an initial speed of 30 m/s. What is the horizontal range of the projectile?
    A. 22.5 m
    B. 39.15 m
    C. 45.0 m
    D. 90.0 m
54. A satellite orbits the Earth in a circular orbit with a radius of 7000 km from the center of the Earth. If the orbital speed of the satellite is 10 km/s, what is the period of the orbit?
    A. 73.3 min.
    B. 100.0 min. .
    C. 103.0 min
    D. 1400.0 min.
55. Kepler's second law states that a line segment joining a planet and the Sun sweeps out equal areas during:
    A. equal distances
    B. equal times
    C. equal speeds
    D. equal velocity
56. What is the acceleration due to gravity at an altitude twice the radius of the earth? (g_E is the gravitational acceleration on the surface of the earth)
    A. $3g_E$
    B. $g_E/3$
    C. $g_E/4$
    D. $g_E/9$

57. According to Newton's law of universal gravitation, the force between two masses is:
    A. Directly proportional to the sum of the masses and inversely proportional to the square of the distance between them
    B. Directly proportional to the product of the masses and inversely proportional to the distance between them
    C. Directly proportional to the sum of the masses and inversely proportional to the distance between them
    D. Directly proportional to the product of the masses and inversely proportional to the square of the distance between them
58. A projectile is launched at an angle of 45^0 with an initial speed of 20 m/s. How would the maximum height and range of the projectile change if the launch angle is increased to 60^0 while keeping the initial speed constant?
    A. Both maximum height and range would increase
    B. Both maximum height and range would decrease
    C. Maximum height would increase, but range would decrease
    D. Maximum height would decrease, but range would increase
59. Evaluate the impact of Newton's law of universal gravitation on the field of physics. How did it change the understanding of gravitational forces?
    A. It provided a universal explanation for gravitational forces and unified the understanding of gravity on Earth and in the heavens.
    B. It explained the elliptical shape of planetary orbits.
    C. It described the equal areas swept out by a planet in equal times.
    D. It helped in understanding the motion of projectiles.
60. Which one of the following is **TRUE** about atmospheres and/or atmospheric pressure?
    A. Atmosphere is the layer of air surrounding the Earth
    B. As altitude increases atmospheric pressure also increases.
    C. Boiling point of water increases with increasing altitude.
    D. Atmospheric pressure is 1KPa at sea level.

61. Suppose you want to create a simulation to demonstrate the effect of changing the radius and speed on the centripetal force experienced by an object in circular motion. How would you describe the variables and expected outcomes?
    A. Variables: Time, distance, mass. Expected outcomes: Increasing time increases centripetal force, increasing distance decreases centripetal force.
    B. Variables: Temperature, pressure, mass. Expected outcomes: Increasing temperature increases centripetal force, increasing pressure decreases centripetal force.
    C. Variables: Radius, speed, mass. Expected outcomes: Increasing speed increases centripetal force, increasing radius decreases centripetal force.
    D. Variables: Volume, density, mass. Expected outcomes: Increasing volume increases centripetal force, increasing density decreases centripetal force.
62. The relative density of a substance is defined as the:
    A. ratio of the density of water to the density of the substance.
    B. the product of the density of the substance to the density of water.
    C. ratio of the density of the substance to the density of water.
    D. the difference between the density of the substance and the density of water.
63. In the process of measuring the atmospheric pressure at certain place, a student found that the column of mercury in a barometer is raised to a height of 700mm. What is the atmospheric pressure?
    A. 109.65 KPa
    B. 101.00 KPa
    C. 93.30 Kpa
    D. 95.20 Kpa
64. A boy of mass 50kg swimming in a pool at a depth of 2m. What is the absolute pressure acting on the boy?
    A. 20.3KPa
    B. 101.3 Kpa
    C. 81.3 Kpa
    D. 121.3 Kpa
65. "The pressure applied to an enclosed fluid is transmitted to every part of the fluid, as well as to the walls of the container without reducing in value." This is
    A. Archimedes' Principle
    B. Bernoulli's Principle
    C. Newton's Principle
    D. Pascal's Principle

66. Which one of the following is **FALSE** about Liquids and /or gases?

A. Liquids have weak bonds, whereas gases have very weak bonds.

B. Liquid particles are close together with no set of pattern.

C. Both liquids and gases occupy the volume of their container.

D. Liquids are incompressible whereas gases are compressible.

67. A solid object of mass 100g totally immersed in water has a weight of 0.6N in the water. What is the density of the object?

A. 100 kg/m^3

B. 1000 kg/m^3

C. 2500 kg/m^3

D. 4000 kg/m^3

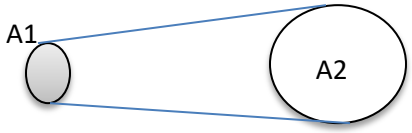
68. Water flows at the rate of 500cm^3 /s at small cross section $A_1 = 5cm^2$. The larger cross section is $A_2 = 25cm^2$. What is the ratio of the speed of the water at A_1 and A_2?

A. 0.2

B. 5

C. 20

D. 100



69. In a hydraulic press, the input piston has a diameter of 0.1 m and the output piston has a diameter of 0.4 m. If a force of 200 N is applied to the input piston, what is the force exerted by the output piston?

A. 2000 N

B. 3200 N

C. 4800 N

D. 5600 N

70. Which of the following high-pressure systems is used in power generation to drive steam turbines?

A. High-pressure air

B. Low-pressure steam

C. High-pressure steam

D. Low-pressure water