



ADAMA SCIENCE AND TECHNOLOGY UNIVERSITY
GRADE 12TH MODEL EXAM FOR ASTU SPECIAL SCHOOL

MAY 2016/2024

GENERAL DIRECTIONS:

- YOU ARE ALLOWED TO WORK ON THE EXAM FOR ONLY **2 HOURS**

THIS BOOKLET CONTAINS PHYSICS MODEL EXAMINATION. IN THIS EXAMINATION, THERE ARE A TOTAL OF 50 MULTIPLE CHOICE ITEMS. ATTEMPT ALL THE ITEMS. FOLLOW THE INSTRUCTION ON THE ANSWER SHEET, THE EXAMINATION PAPER CAREFULLY AND CHOOSE THE BEST ANSWER FROM THE SUGGESTED OPTIONS AND WRITE THE LETTER OF YOUR CHOICE ON THE SEPARATE ANSWER SHEET PROVIDED.

ANY FORM OF CHEATING OR AN ATTEMPT TO CHEAT IN THE EXAMINATION ROOM IS STRICTLY FIRBIDDEN

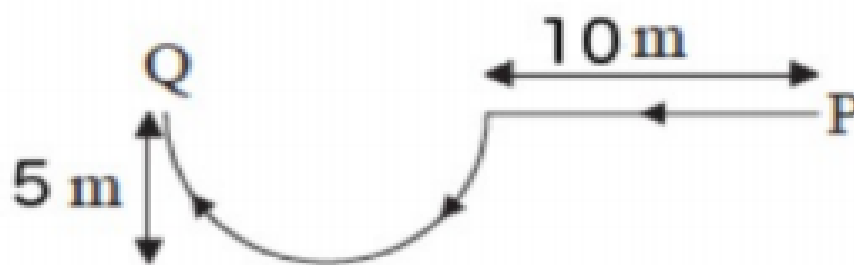
- YOU MAY REFER THE INFORMATION GIVEN BELOW WHEN YOU WORK ON SOME OF THE QUESTIONS.

Constant	Symbol	Value
Acceleration due to gravity	g	10 m/s^2
$e = 1.6 \times 10^{-19} \text{ C}$	π	3.14
$\sin 60^\circ = \cos 30^\circ = \frac{\sqrt{3}}{2} = 0.86$	$\sin 30^\circ = \cos 60^\circ = 0.5$	

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

CHOOSE THE BEST ANSWER FROM THE GIVEN ALTERNATIVES

1. The number of significant digits in the significant figures 0.000500, 600100, and 0.0004020 respectively are:
A) 1, 6, and 3 B) 3, 4, and 4 C) 1, 4, and 4 D) 3, 4, and 2
2. Which one of the following sets does not contain basic physical quantities?
A) Area, Time, Distance. B) Mass, Volume, Density.
C) Time, Mass, length. D) Velocity, Pressure, Power.
3. Which of the following is not a correct statement?
A) Static coefficient of friction is greater than kinetic coefficient of friction
B) Coefficient of friction is equal to the ratio between normal force and force of friction.
C) Coefficient of friction is unit less.
D) If normal force is doubled, force of friction will be doubled.
4. A particle moves in a circular path of radius r with speed v . It then increases its speed to $2v$ while traveling along the same circular path. The centripetal acceleration of the particle has changed by what factor?
A) 0.25 B) 0.5 C) 2 D) 4
5. A simple pendulum having a length L and mass M swings with period T . If both L and M are quadrupled, what is the new period in terms of T ?
A) $16T$ B) $2T$ C) $4T$ D) $8T$
6. If the potential due to a point charge is V at a distance R from the charge, the distance at which the potential is $2V$ is
A) $4R$ B) $2R$ C) $R/2$ D) $R/4$.
7. A cylindrical conductor has resistivity ρ , resistance R , length L , and diameter D . What will be the new resistance R_{new} in terms of the original resistance R , if both length and diameter are tripled?
A) $3R$ B) $1/9R$ C) $1/3R$ D) $9R$
8. To produce a current with a coil and bar magnet you can:
A) Move the coil close to the magnet. B) Move both the coil and the magnet.
C) Move either the coil or magnet D) All
9. A person walks from Point P to Point Q. The curved part of his path is a semicircle. What is the magnitude of his displacement from point P to point Q?



- A) 15m B) 20m C) 5m D) 0m

10. If two projectile A and B are thrown with the same speed but at angles of 30° and 60° with the horizontal respectively. Range of A will be
 A) Less than that of B B) greater than that of B C) Equal to that of B D) $\frac{1}{2}$ that of B
11. Which of the following statements is correct about work done?
 A) If no displacement takes place, work is said to be done
 B) If the force is doubled, the work is quadrupled
 C) If both the force and displacement are doubled, the work is doubled.
 D) The work done is negative when the force has a component opposite to the displacement.
12. Assume there are three charged objects namely A, B, and C. When objects A and B are brought together, they repel. When objects B and C are brought together, they attract each other. Which of the following are true?
 A) Objects A and B possess charges of the opposite sign.
 B) Objects A and C possess charges of opposite sign.
 C) All three objects possess charges of the same sign.
 D) Objects B and C possess charges of the same sign.
13. An electron is at rest in a magnetic field B and a proton is moving with speed v parallel to the field. What are the magnetic forces on these charges?
 A) The force on the proton is evB , the force on the electron is zero.
 B) The force on the proton is maximum; the force on the electron is zero.
 C) The force on the proton is zero; the force on the electron is zero.
 D) The force on the proton is zero, the force on the electron is evB .
14. Two objects with different masses and temperatures are placed in thermal contact. Heat energy flows from the
 A) Smaller mass object to larger mass object
 B) Larger mass object to smaller mass object
 C) Object at lower temperature to the one at higher temperature

- D) Object at higher temperature to the one at lower temperature.
15. A block of mass m attached to a spring with spring constant k undergoes SHM on a frictionless horizontal surface. Which of the following would NOT change the period of the oscillation?
- A) Double the amplitude of vibration and double the mass.
 B) Double the gravitational field strength and double the mass.
 C) Double the gravitational field strength and double the spring constant.
 D) Double the mass and double the spring constant.
16. The specific heat capacity of substance A is greater than that of B. Both A and B are at the same initial temperature and have equal masses. When equal amounts of heat energy are added to them, how do you compare the final temperatures of A and B?
- A) $T_A = T_B$ B) $T_A > T_B$ C) $T_A < T_B$ D) $T_A = 2T_B$
17. Which of the following is true about conservation of linear momentum of a system?
- A) Momentum before collision is less than momentum after collision.
 B) Momentum before collision is greater than momentum after collision.
 C) In the absence of net external force, momentum of the system is conserved.
 D) If the system is isolated, its momentum after collision is less than its momentum before collision.
18. A system consists of two masses placed along the x-axis: m_1 at $x = 0$ and m_2 at $x = 4m$. If $m_2 < m_1$, the center of mass of the system lies on the x-axis
- A) Mid-way between the masses, B) Between the masses and nearer to m_2
 C) To the right of m_2 , D) Between the masses and nearer to m_1 .
19. A 3kg sphere makes a perfectly inelastic collision with a second sphere initially at rest. The composite system moves with a speed equal to one-third of the original speed of the 3kg sphere. What is the mass of the second sphere?
- A) 3kg B) 6kg C) $\frac{2}{3}$ kg D) 9kg
20. In certain process, 400J of heat is added to a system and the system simultaneously does 100J of work. The change in the internal energy of the system is:
- A) 500J B) -500J C) -300J D) 300J
21. The emf of a battery is equal to its terminal potential difference
- A) When a large current is in the battery. B) Under all conditions.
 C) When there is no current in the battery. D) When the battery is being charged.
22. Two identical coins carry equal but opposite charges of magnitude $16\mu\text{C}$. The capacitance of the combination is $2\mu\text{F}$. What is the potential difference between the coins?
- A) 32V B) 4V C) 8V D) 16V
23. A process which involves no change in the temperature of the system is

- A) Adiabatic B) Isobaric C) Cyclic D) Isothermal

24. Objects A has a charge of $+2\mu\text{C}$, and object B has a charge of $+6\mu\text{C}$.

Which statement is true about the electric forces on the objects?

- A) $F_{AB} = -3F_{BA}$ B) $3F_{AB} = -F_{BA}$ C) $F_{AB} = F_{BA}$ D) $F_{AB} = -F_{BA}$

25. The principle of conservation of angular momentum states that

A) The angular momentum of an object will be conserved if the net force acting on the object is a constant.

B) The angular momentum of an object will be conserved if the net force acting on the object is zero.

C) The angular momentum of an object will be conserved if the net torque acting on the object is a constant.

D) The angular momentum of an object will be conserved if the net torque acting on the object is zero.

26. When a substance experiences a phase change from solid to liquid by absorbing heat, the heat of transformation is

- A) Latent heat of solidification B) Latent heat of vaporization
C) Latent heat of condensation D) Latent heat of fusion

27. One of the following is a non-spontaneous transfer of energy

- A) Heat B) Temperature C) Work D) Energy

28. A mass-spring system undergoing a simple harmonic motion has an amplitude A . When the kinetic energy of the object equals three times the potential energy stored in the spring, what is the position of the object from its equilibrium position?

- A) $x = 5A$ B) $x = 2A$ C) $x = 4A$ D) $x = 0.5A$

29. If ΔT_c , ΔT_k , and ΔT_F are temperature differences in Celsius, Kelvin, and Fahrenheit scales respectively, which of the following is a correct relation between the temperature differences?

- A) $\Delta T_c = \Delta T_F$ B) $\Delta T_c = (5/9)\Delta T_F$ C) $\Delta T_c = \Delta T_k - 273$ D) $\Delta T_c = (9/5)\Delta T_F$

30. By how much would the gravitational force between two objects be multiplied if the mass of one of the objects is multiplied by a factor of 2 and the mass of the other object is multiplied by a factor of 3?

- A) 6 B) 5 C) 0.667 D) 1.5

31. If the distance d (in meters) traveled by an object in time t (in seconds) is given by the formula $d = A + Bt^2$, the SI units of A and B must be

- A) meters for both A and B . B) m/s for A and m/s^2 for B .
C) meters for A and m/s^2 for B . D) m/s^2 for both A and B .

32. If vector $\mathbf{A}$ has components A_x and A_y and makes an angle θ with the $+x$ -axis, then

A) $A = \sqrt{A_x^2 + A_y^2}$ (Where A is the magnitude of A).

B) $\theta = \frac{A_x}{A_y}$ C) $\cos\theta = \frac{A_x}{\sqrt{A_x^2 + A_y^2}}$ D) $\tan\theta = \frac{A_x}{A_y}$

33. A bullet is dropped into a river from a very high bridge. At the same time, another bullet is fired from a gun straight down towards the water. If air resistance is negligible, the acceleration of the bullets just before they strike the water:
- A) is greater for the dropped bullet. B) is greater for the fired bullet.
C) is the same for both bullets. D) depends on how high they started.
34. An object starts from rest and accelerates uniformly. If it moves 2m during the first second, then, during the next 3 seconds, it will move
- A) 6 m. B) 9 m. C) 10m. D) 18m.
35. If human beings ever travel to a planet whose mass and radius are both twice that of the earth, their weight on that planet will be
- A) equal to their weight on earth B) twice their weight on earth
C) half their weight on earth D) one-fourth their weight on earth
36. Which of the following statements is true for an inelastic collision?
- A) Both momentum and kinetic energy are conserved.
B) Momentum is conserved, but kinetic energy is not conserved.
C) Kinetic energy is conserved, but momentum is not conserved.
D) Both momentum and kinetic energy are not conserved
37. A bicycle wheel rotating at a rate of 12 rad /s begins to accelerate at a rate of 2 rad /s^2 . After 5 seconds the rate of rotation will be
- A) 2 rad s B) 10 rad s C) 17 rad s D) 22 rad s
38. A thin uniform bar has a moment of inertia I about an axis perpendicular to it through its center. If both the mass and length of this bar are doubled, its moment of inertia about the same axis will be
- A) 2I. B) 4I. C) 8I. D) 16I.
39. Which has a greater buoyant force on it, a 25 cm^3 piece of wood floating with part of its volume above water or a 25 cm^3 piece of submerged iron?
- A) The floating wood. B) The submerged iron.
C) They have the same buoyant force on them. D) It is impossible to tell without knowing their weights
40. Which one of the following quantities does not have the unit of force per unit area?
- A) Stress B) Strain C) Young's modulus of elasticity D) Pressure.

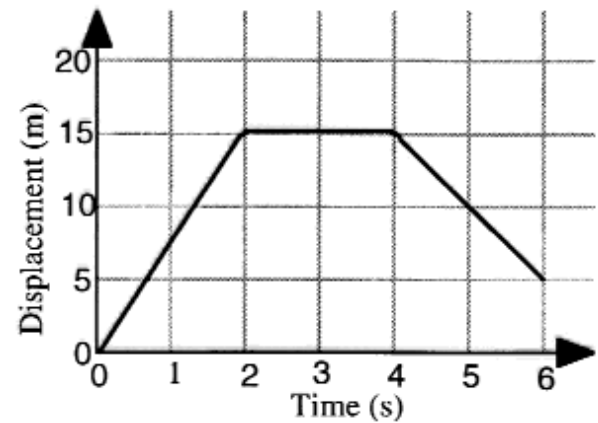
41. A metal ring is oriented with the plane of its area perpendicular to a spatially uniform magnetic field that increases at a steady rate. After the radius of the ring is doubled, while the rate of increase of the field is cut in half, the emf induced in the ring
- A) remains the same. B) increases by a factor of 2.
C) increases by a factor of 4. D) decreases by a factor of 2.
42. Which of the following statements about radio waves, infrared radiation, and x rays are correct?
- A) They all have the same wavelength in vacuum.
B) They all have the same frequency in vacuum.
C) They all have exactly the same speed as visible light in vacuum.
D) The short-wavelength x rays travel faster through vacuum than the long-wavelength radio waves.
43. Tube 1 and tube 2 are connected together. A fluid flowing through these tubes has a speed of 2m/s in tube 1 and a speed of 8m/s in tube 2. What is the ratio of the cross-sectional radius of tube 1 to the cross-sectional radius of tube 2?
- A) 4 B) 8 C) 2 D) 16
44. A 4 kg object is being acted upon by three forces. Two of the forces are equal to $(2\hat{i}+3\hat{j})$ N and $(-4\hat{i}+5\hat{j})$ N respectively. The third force is unknown. If the object is moving with an acceleration of $(3\hat{i} + 6\hat{j})$ m/s². What is the unknown force?
- A) $(-2\hat{i}+8\hat{j})$ N B) $(6\hat{i}-2\hat{j})$ N C) $(14\hat{i}+16\hat{j})$ N D) $(\hat{i}+14\hat{j})$ N
45. If $\vec{a} = 3\hat{i} - 2\hat{j} + \hat{k}$ and $\vec{b} = 4\hat{i} + 3\hat{j} - \lambda\hat{k}$ are orthogonal, then λ ?
- A) -6 B) -12 C) 12 D) 6
46. Which of the following is true about Newton's 1st law?
- A) The force acting on an object is directly proportional to the acceleration produced by net force
B) An object will remain at rest or move in a straight line unless acted upon by a net force
C) For every action, there is an equal reaction in the same direction
D) For every action, there is an equal and opposite reaction
47. Which of the following statements is correct about Kepler's second Law?
- A) A planet is moving fastest when it is at perihelion.
B) A planet is moving fastest when it is at aphelion.
C) A planet is moving slowest when it is at perihelion.
D) A planet moves slowest when it is closest to the sun.
48. Which of the following statements is correct about work-kinetic energy theorem?
- A) The speed of an object increases if the net work done on it is positive.
B) The speed of an object increases if the net work done on it is negative.

C) The speed of an object decreases if the net work done on it is positive.

D) Work is done by the net force in moving an object with a constant speed.

Questions 49 and 50 refer to the figure shown on the right, which represents the displacement of a particle as a function of time.

The particle moves in a straight line.



49. What is the average velocity of the particle during the time interval 0 to 5 seconds?

- A) +65 m/s B) +55 m/s C) +13 m/s D) +2.0 m/s

50. What is the instantaneous velocity of the particle at time 5 seconds?

- A) - 5.0 m/s B) - 2.0 m/s C) 0 D) + 2.0 m/s

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ANSWER SHEET

SUBJECT: *Physics*

ACADEMIC YEAR: 2016/ 2024

Name _____ ***Section*** _____ ***Roll No.*** _____

1. _____	16. _____	31. _____	46. _____
2. _____	17. _____	32. _____	47. _____
3. _____	18. _____	33. _____	48. _____
4. _____	19. _____	34. _____	49. _____
5. _____	20. _____	35. _____	50. _____
6. _____	21. _____	36. _____	
7. _____	22. _____	37. _____	
8. _____	23. _____	38. _____	
9. _____	24. _____	39. _____	
10. _____	25.. _____	40. _____	
11. _____	26. _____	41. _____	
12. _____	27. _____	42. _____	
13. _____	28. _____	43. _____	
14. _____	29. _____	44. _____	
15. _____	30. _____	45. _____	