FIRST-YEAR PHYSICS EXAM

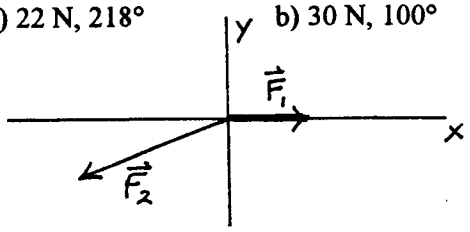
JANUARY, 2000

DIRECTIONS: For each statement or question, fill in the appropriate space on the answer sheet completely. Use the letter preceding the word or phrase, which best completes or answers the question. Each question is worth 4 points.

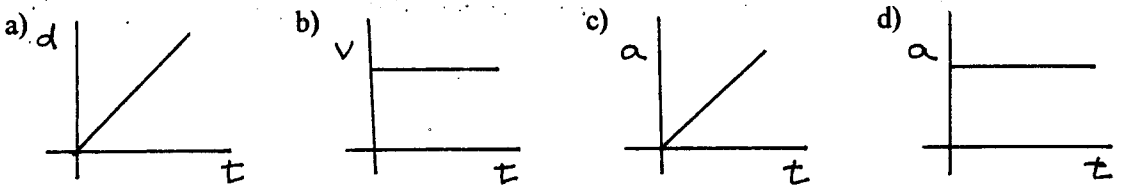
CONSTANTS: g (Earth) = 10 m/s^2

1. The density of copper is 8.9 g/cm^3. What is the mass of a copper penny, 19 mm in diameter and 1.0 mm thick?
   a) 2.5 g b) 0.25 g c) 0.025 g d) 0.00025 g

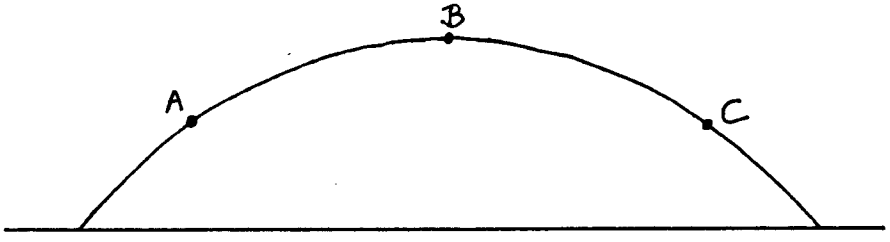
2. Shown below are two forces $\mathbf{F_1}$ and $\mathbf{F_2}$. Using the positive x-axis as a reference, $\mathbf{F_1}$ has magnitude of 20.0N and direction of 0°, $\mathbf{F_2}$ has magnitude of 40.0N and direction of 200°. What are the magnitude and direction of the resultant of the two forces?
   a) 22 N, 218° b) 30 N, 100° c) 22 N, 322° d) 30 N, 280°



3. Which of the following graphs represents constant acceleration?



4. The curve below represents the path of a projectile near Earth's surface. Point B is at the highest point along the projectile's path. Points A and C are at the same height above the ground. Assume that the ground is level, and there is no air friction. Select the true statement about the projectile at point B.
   a) The acceleration of the projectile is zero.
   b) The velocity of the projectile is zero.
   c) The x-component of the projectile's velocity is zero.
   d) The y-component of the projectile's velocity is zero.



5. Refer to the figure in problem 4. Which of the following quantities are the same at both points A and C?
   a) The magnitude of the x-component of the projectile's velocity.
   b) The magnitude of the y-component of the projectile's velocity.
   c) The projectile's acceleration.
   d) All of the above.

6. Refer to the figure in problem 4. At which point is the weight of the projectile the greatest?
   a) A b) B c) C d) Same weight at each point

7. If the projectile in problem 4. is fired at 30° relative to the horizontal with velocity of 350 m/sec, how long does it take for it to hit the ground?
a) 18 sec b) 35 sec c) 30 sec d) 60 sec

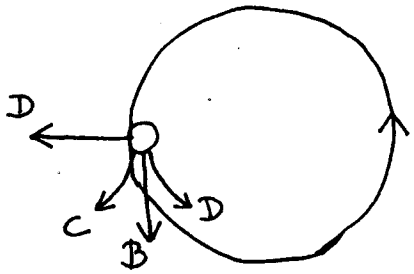
8. A 25-kg box slides down an incline with acceleration of 0.8 m/sec^2. The angle between the incline and the horizontal is 10°. What is the coefficient of kinetic friction between the box and the surface of the incline?
a) 0.1 b) 0.2 c) 0.3 d) 0.4

9. A stone dropped from rest from height h hits the ground after 10 sec. How long does it take for the stone to hit the ground if instead it's dropped from height $2h$?
a) 12 sec b) 14 sec c) 20 sec d) 24 sec

10. A book is placed on a flat tabletop. Identify the force which is in reaction (reaction force) to the weight of the book.
a) The force of the table on the book.
b) The force of the book on the table.
c) The force of the Earth on the book.
d) The force of the book on the Earth.

11. A coin is placed on top of a rotating platform. The view from the top, with the platform rotating counter-clockwise and the coin stationary relative to the platform is shown in the figure below. If all of a sudden there were no friction between the coin and the platform, which would be the correct path of the coin immediately after the friction is taken away?

a) A b) B c) C d) D



12. A single force F accelerates mass m with acceleration a. If an object with twice the mass is accelerated by a quarter as much force, what will be its acceleration?
a) $2a$ b) $(1/2)\,a$ c) $(1/4)\,a$ d) $(1/8)\,a$

13. How much work is done raising a 60-kg object from height of 20 m to 60 m?
a) 12,000 J b) 24,000 J c) 36,000 J d) 48,000 J

14. How much work is done accelerating a 20-kg object from speed of 10 m/sec to 40 m/sec?
a) 1000 J b) 400 J c) 15,000 J d) 16,000 J

15. A 5.0-kg projectile is launched at speed of 60 m/sec at angle of 35° with respect to the horizontal. What is its kinetic energy at the top of its flight?
a) 6,000 J b) 9,000 J c) 4,500 J d) 3,000 J

16. In problem 15 what is the potential energy of the projectile at the top of its flight?
a) 9000 J b) 6000 J c) 3000 J d) 1000 J

17. A 2.0 kg object is thrown straight up with velocity of 25 m/sec. Once it's in the air, what is its speed when its potential energy reaches 200 J?
a) 5 m/sec b) 12 m/sec c) 18 m/sec d) 21 m/sec

18. A 50.0-kg box if pushed across a floor by a constant horizontal force of 200 N. What is the force of friction?
a) 50 N b) 200 N c) 500 N d) 700 N

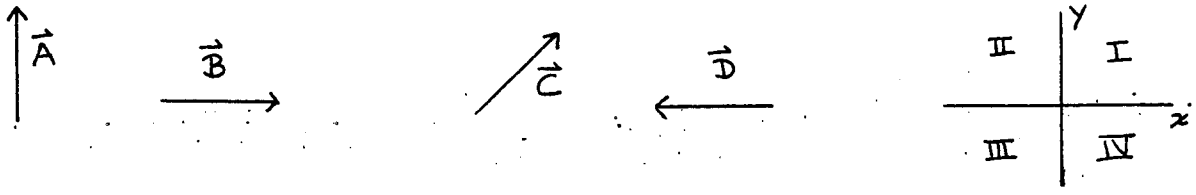
19. In problem 18, what is the coefficient of kinetic friction?
a) 0.1 b) 0.2 c) 0.3 d) 0.4

20. In problem 18, how much work is done by the 200 N applied force if it moves the box a horizontal distance of 60 m?
a) 6,000 J b) 12,000 J c) 40 J d) 20 J

21. In problem 20, the 200 N applied force pushes the box a horizontal distance of 60 m in 5 minutes. How much power was generated by the force?
a) 40 Watts b) 1000 Watts c) 2400 Watts d) 360 Watts

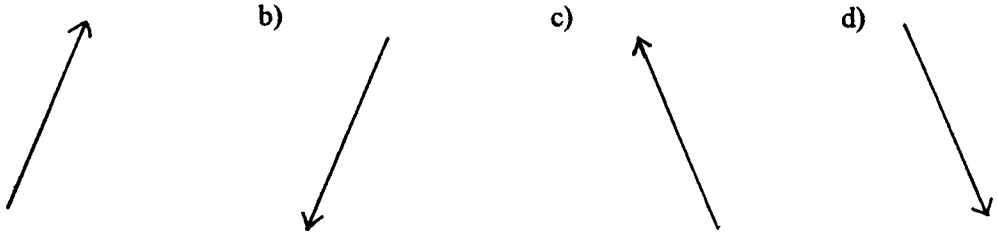
22. A merry-go-round rotates at a rate of once per 30 seconds. What is the centripetal force on a 60-kg person who stands 5.0 m from the axis of rotation of the merry-go-round?
a) 8 N b) 13 N c) 58 N d) 210 N

23. Four vectors are shown below. In what quadrant will the vector sum of **A** + **B** + **C** fall?
a) I b) II c) III d) IV



24. If all of the 4 forces shown in problem 23 acted on the same object, which of the following forces would best balance the resultant of those forces?

a) b) c) d)



25. Which of the following is a vector quantity?
a) mass b) acceleration c) pressure d) energy

ANSWERS PHYSICS I

JAN 2000

1 A	6 D	11 B	16 C	21 A
2 A	7 B	12 D	17 D	22 B
3 D	8 A	13 B	18 B	23 A
4 D	9 B	14 C	19 D	24 B
5 D	10 D	15 A	20 B	25 B