

How to Calculate Your Score

Step 1: Figure out your raw score. Use the answer key to count the number of questions you answered correctly and the number of questions you answered incorrectly. (Do not count any questions you left blank.) Multiply the number wrong by 0.25 and subtract the result from the number correct. Round the result to the nearest whole number. This is your raw score.

SAT SUBJECT TEST: PHYSICS PRACTICE TEST 3

$$\begin{array}{ccc} \text{Number} & \text{Number} & \text{Raw} \\ \text{right} & \text{wrong} & \text{score} \\ \square & - \left(0.25 \times \square \right) & = \square \end{array}$$

Step 2: Find your scaled score. In the Score Conversion Table below, find your raw score (rounded to the nearest whole number) in one of the columns to the left. The score directly to the right of that number will be your scaled score.

A note on your practice test scores: Don't take these scores too literally. Practice test conditions cannot precisely mirror real test conditions. Your actual SAT Subject Test: Physics score will almost certainly vary from your diagnostic and practice test scores. However, your scores on the diagnostic and practice tests will give you a rough idea of your range on the actual exam.

Raw	Scaled
75	800
74	800
73	800
72	800
71	800

70	800
69	800
68	800
67	800
66	800
65	800
64	800
63	800
62	790
61	790
60	780
59	780
58	770
57	770
56	760
55	760
54	750
53	750
52	740
51	730

50	730
49	720
48	720
47	710
46	700
45	700
44	690
43	690
42	680
41	670
40	670
39	660
38	650
37	650
36	640
35	640
34	630
33	630
32	620

31	610
30	610
29	600
28	600
27	590
26	580
25	580
24	570
23	570
22	560
21	550
20	540
19	540
18	530
17	530
16	520
15	510
14	510
13	500

12	490
11	480
10	480
9	470
8	470
7	460
6	450
5	450
4	440
3	430
2	430
1	420
0	410
-1	410
-2	400
-3	390
-4	390
-5	380
-6	370

-7	370
-8	360
-9	350
-10	350
-11	340
-12	330
-13	330
-14	320
-15	310
-16	310
-17	300
-18	290
-19	290

Score Conversion Table

Practice Test 3 Answer Grid

- | | | | | | |
|-----|---|-----|---|-----|---|
| 1. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 26. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 51. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E |
| 2. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 27. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 52. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E |
| 3. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 28. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 53. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E |
| 4. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 29. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 54. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E |
| 5. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 30. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 55. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E |
| 6. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 31. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 56. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E |
| 7. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 32. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 57. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E |
| 8. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 33. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 58. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E |
| 9. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 34. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 59. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E |
| 10. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 35. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 60. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E |
| 11. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 36. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 61. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E |
| 12. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 37. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 62. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E |
| 13. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 38. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 63. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E |
| 14. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 39. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 64. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E |
| 15. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 40. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 65. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E |
| 16. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 41. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 66. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E |
| 17. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 42. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 67. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E |
| 18. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 43. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 68. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E |
| 19. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 44. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 69. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E |
| 20. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 45. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 70. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E |
| 21. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 46. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 71. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E |
| 22. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 47. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 72. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E |
| 23. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 48. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 73. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E |
| 24. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 49. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 74. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E |
| 25. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 50. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E | 75. | <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E |

Practice Test 3

PART A

Directions

Each set of lettered choices below relates to the numbered questions immediately following it. Select the one lettered choice that best answers each question. A choice may be used once, more than once, or not at all in each set.

Questions 1–3 relate to the following.

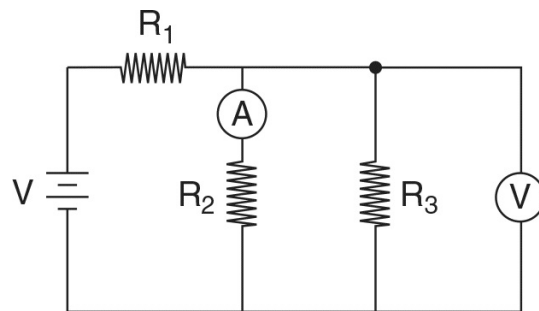
Two masses m_1 and m_2 are separated by a distance R so that there is a gravitational force F between them. The following choices refer to the gravitational force on m_1 due to m_2 .

- (A) It is quadrupled.
- (B) It is doubled.
- (C) It remains the same.
- (D) It is halved.
- (E) It is quartered.

1. What happens to the magnitude of the force on m_1 if the mass of m_2 is doubled?

2. What happens to the magnitude of the force on m_1 if the distance between the centers of the masses is doubled?
3. What happens to the magnitude of the force on m_1 if the distance between the centers of the masses is halved?

Questions 4–6 relate to the following circuit and the choices that follow. The resistors R_1 , R_2 , and R_3 each have a different value.



- (A) R_1 , R_2 , and R_3
- (B) R_1 only
- (C) R_2 only
- (D) R_3 only
- (E) R_2 and R_3 only

4. Through which resistor(s) will the total current in the circuit pass?
5. Through which resistor(s) will the ammeter read the current?

6. Across which resistor(s) will the voltmeter correctly read the voltage?

Questions 7–9 relate to the following.

Five objects are moving in straight-line paths. The objects all cross a starting line at the instant a clock is started. The distances from the starting line in meters after 1, 2, 3, 4, and 5 equal time units are as follows.

<u>Object</u>	Time (units)				
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
(A)	1 m	4 m	9 m	16 m	25 m
(B)	2 m	2 m	4 m	4 m	6 m
(C)	2 m	4 m	6 m	8 m	10 m
(D)	6 m	11 m	15 m	18 m	20 m
(E)	4 m	9 m	15 m	22 m	29 m

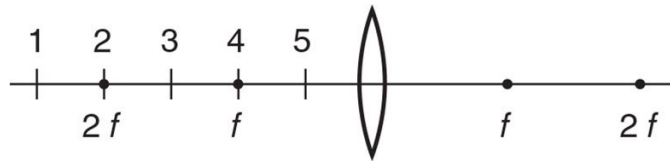
7. Which object is moving with a constant velocity?

8. Which object could be in free fall, neglecting air resistance?

9. Which object's acceleration is opposite to its velocity?

Questions 10–12 relate to the converging lens and principal axis shown and the choices that follow.

The focal length f and twice the focal length $2f$ are marked on either side of the lens.



- (A) position 1
- (B) position 2
- (C) position 3
- (D) position 4
- (E) position 5

10. At which position could a candle be placed so that a virtual image would be formed?
11. At which position could a candle be placed so that an image smaller than the candle would be formed?
12. At which position could a candle be placed so that neither a real nor a virtual image would be formed?

PART B

Directions

Each of the questions or incomplete statements below is followed by five answer choices. Select the one that is best in each case.

13. Which of the following radioactive processes, when occurring separately, must alter the atomic number of the radioactive nucleus?

- I. alpha decay
- II. beta decay
- III. gamma decay

- (A) I only
- (B) II only
- (C) III only
- (D) I and II only
- (E) I, II, and III

14.



The diagram above shows an isolated positive charge Q . Point Y is three times as far away from Q as point X . The ratio of the electric force that

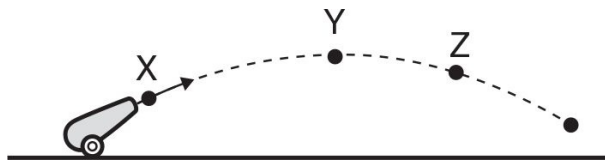
would act on a small charge placed at point Y compared to the charge placed at point X is

- (A) 1 to 9.
- (B) 1 to 3.
- (C) 1 to 1.
- (D) 3 to 1.
- (E) 9 to 1.

15. Which of the following particles would experience the greatest electric force in the same uniform electric field?

- (A) proton
- (B) electron
- (C) alpha particle
- (D) neutron
- (E) photon

Questions 16–18 refer to the figure below.



A ball is projected and follows a parabolic path. Point Y is the highest point on the path, and air resistance is negligible.

16. Which of the following is true of how the speeds of the ball at the three points compare?

(A) $v_X > v_Y > v_Z$

(B) $v_X > v_Z > v_Y$

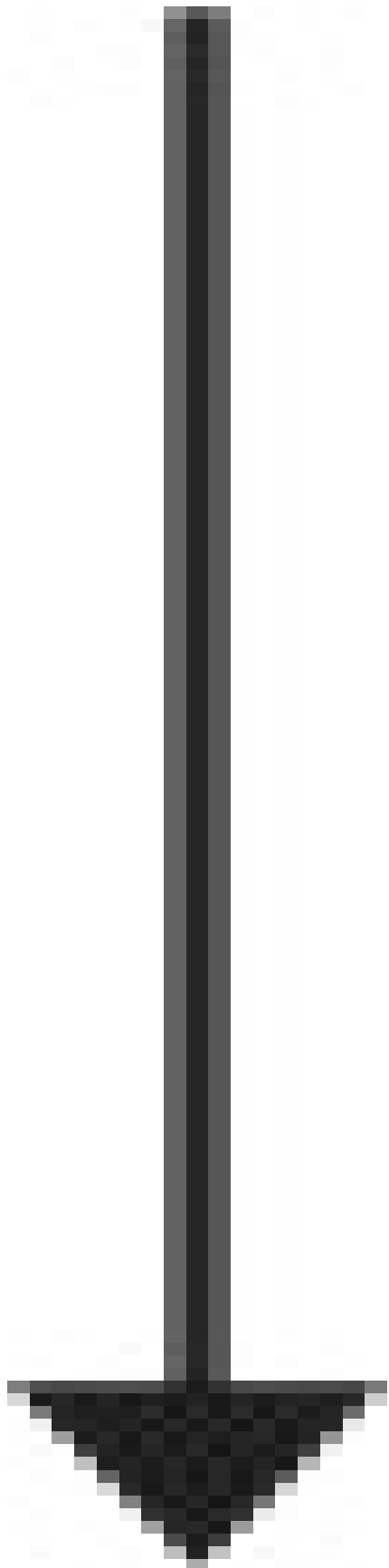
(C) $v_Y > v_X > v_Z$

(D) $v_Z > v_X = v_Y$

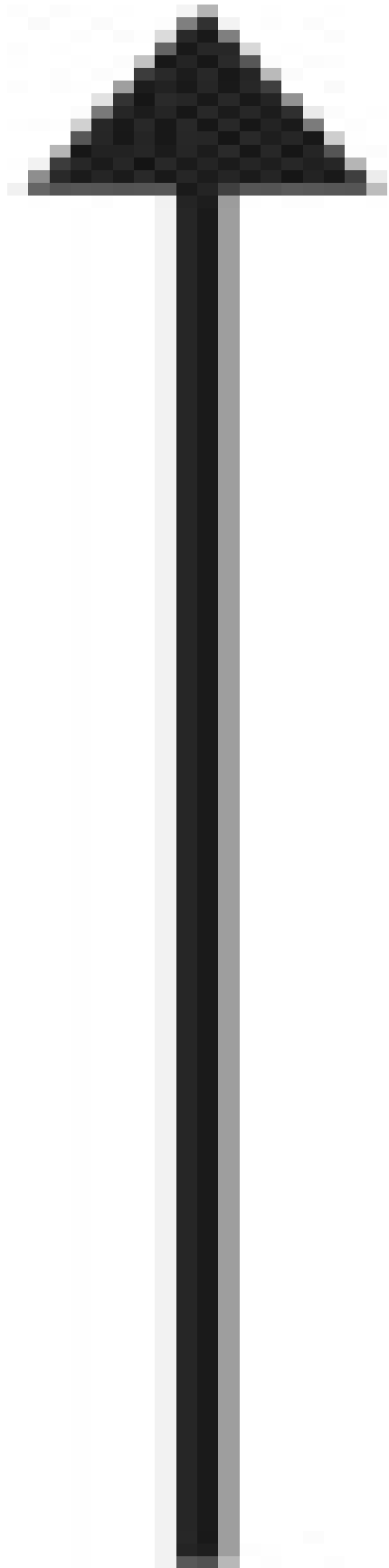
(E) $v_Y > v_X = v_Z$

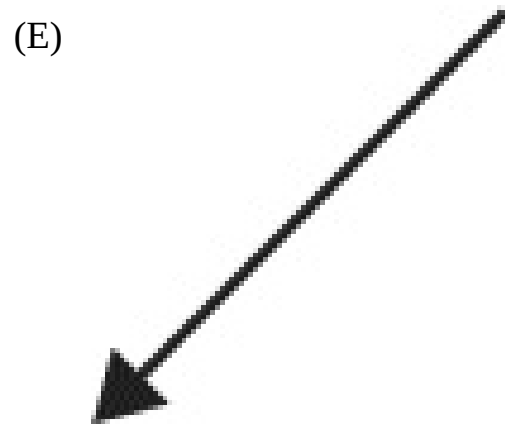
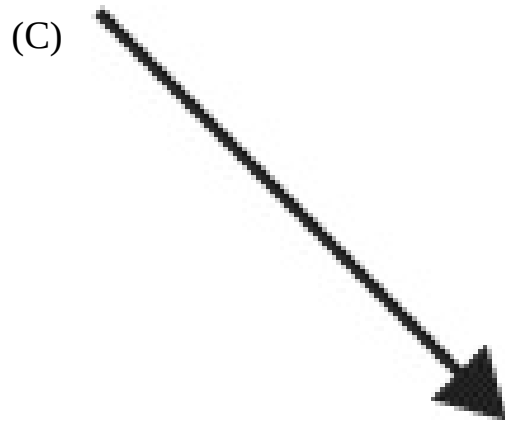
17. Which of the following best shows the direction of the acceleration of the ball at point Z?

(A)



(B)

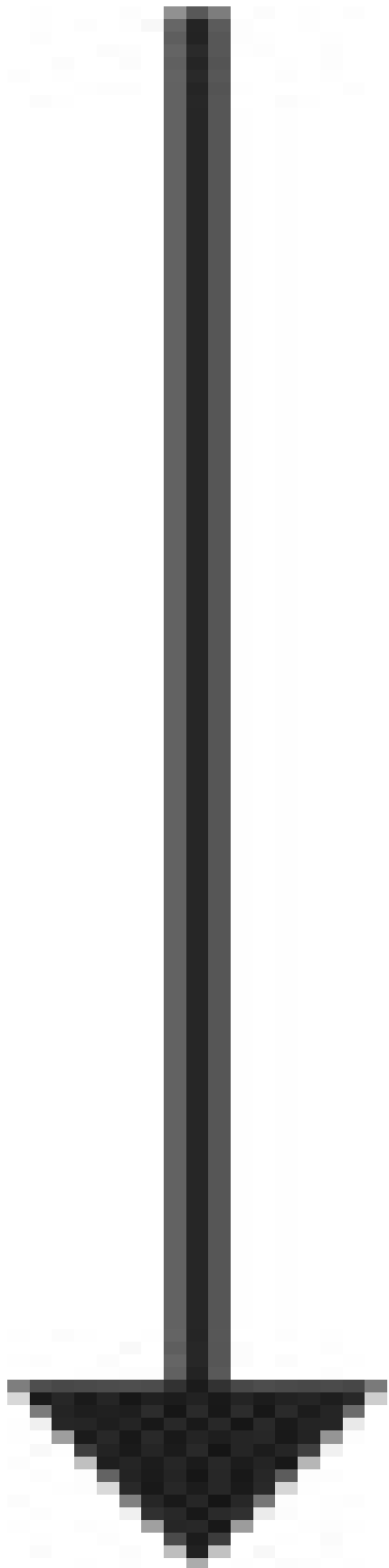




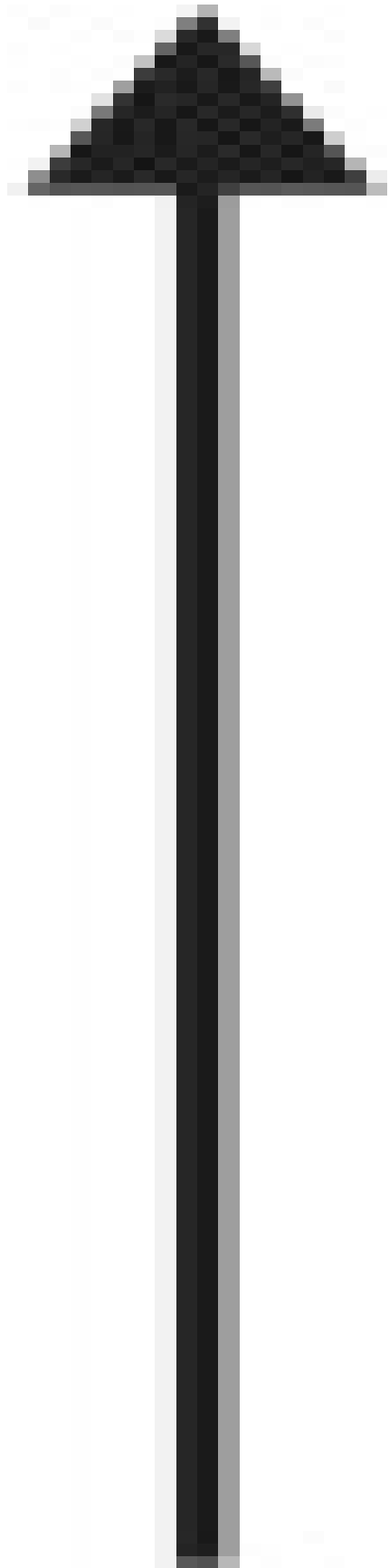
18. What is the direction of the net force acting on the ball at point Y?

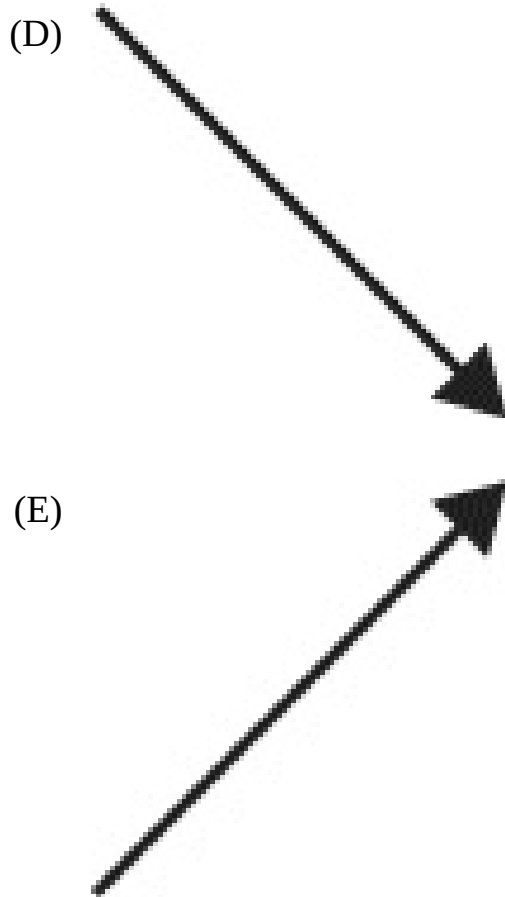


(B)



(C)

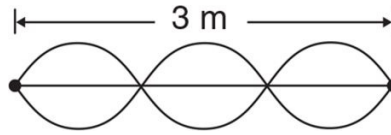




19. Neutral isotopes of the same element may have different numbers of

- (A) protons.
- (B) neutrons.
- (C) electrons.
- (D) alpha particles.
- (E) positrons.

Questions 20–21 refer to the standing wave in a vibrating string 3 meters long as shown below. The frequency of the wave is 60 Hz.

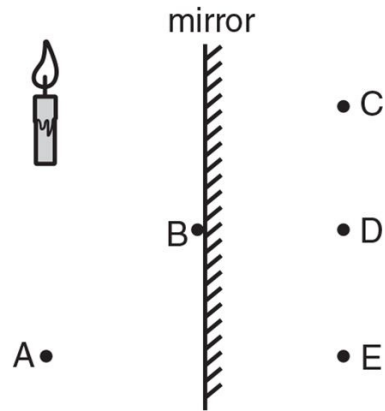


20. The wavelength of the wave is

- (A) 1 m.
- (B) 2 m.
- (C) 3 m.
- (D) 6 m.
- (E) 9 m.

21. The speed of the wave is

- (A) 180 m/s.
- (B) 120 m/s.
- (C) 60 m/s.
- (D) 30 m/s.
- (E) 6 m/s.

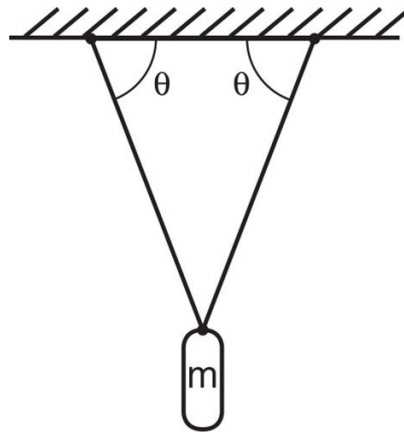


22.

A candle is placed near a plane mirror as shown above. At which point above is the image of the candle formed?

- (A) A
 - (B) B
 - (C) C
 - (D) D
 - (E) E
23. Which of the following was one of the two basic postulates of special relativity formulated by Albert Einstein?
- (A) Accelerating reference frames are equivalent to reference frames that are moving with a constant velocity.
 - (B) The speed of light has the same constant value in all inertial reference frames.
 - (C) Photons move slightly faster than light waves.
 - (D) When moving the speed of light, mass will be converted to pure energy.
 - (E) All physical laws are relative.

24. A space traveler is moving relative to the Earth at 0.6 times the speed of light, as measured in the Earth's frame of reference. In one year as measured in the Earth's frame of reference, the space traveler will
- (A) age more than one year.
 - (B) age less than one year.
 - (C) age exactly one year.
 - (D) not age at all.
 - (E) become younger.



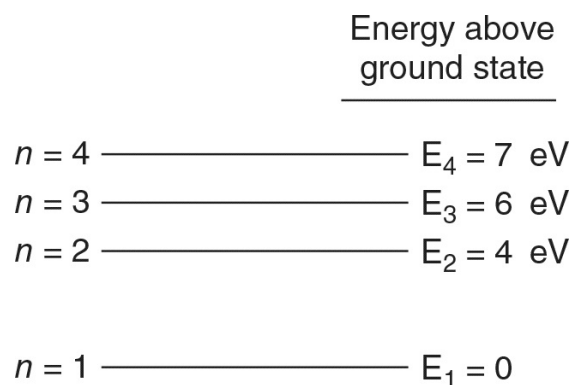
25.

A mass m is hung from two light strings as shown above. The tension in each string is

- (A) $mg \cos\theta$
- (B) $2 mg \cos\theta$
- (C) $mg \sin\theta$
- (D) $\frac{1}{2} mg \sin\theta$

(E) $\frac{mg}{2 \sin \theta}$

Questions 26–27 refer to the energy level diagram for a hypothetical atom shown below. The energy for each level is given above ground state.



26. Which of the following photon energies could NOT be emitted from this atom after it has been excited to the 4th energy level?

- (A) 1 eV
- (B) 2 eV
- (C) 3 eV
- (D) 4 eV
- (E) 5 eV

27. Which of the following transitions will produce the photon with the highest frequency?

- (A) $n = 2$ to $n = 1$
- (B) $n = 3$ to $n = 1$

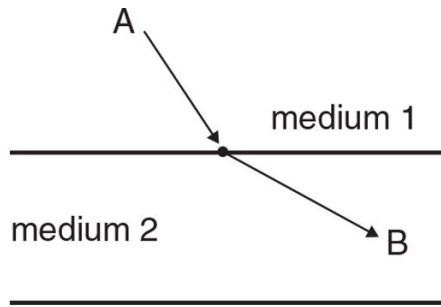
- (C) $n = 3$ to $n = 2$
- (D) $n = 4$ to $n = 1$
- (E) $n = 4$ to $n = 3$

28. If the mass of an object is doubled, and the net force acting on the object is quadrupled, the acceleration of the object is

- (A) quartered.
- (B) halved.
- (C) unchanged.
- (D) doubled.
- (E) quadrupled.

29. An object starts from rest and accelerates at 5 m/s^2 . How far will it travel during the first 4 seconds?

- (A) 20 m
- (B) 40 m
- (C) 80 m
- (D) 120 m
- (E) 160 m



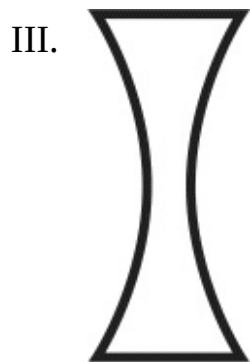
30.

Light passes from medium 1 to medium 2 and bends along the path between points A and B as shown above. Which of the following statements is correct?

- (A) Medium 1 is more dense than medium 2.
- (B) Medium 1 is less dense than medium 2.
- (C) The speed of the light in medium 1 is greater than the speed of the light in medium 2.
- (D) The frequency of the light in medium 1 is greater than the frequency of the light in medium 2.
- (E) The wavelength is the same in medium 1 and medium 2.

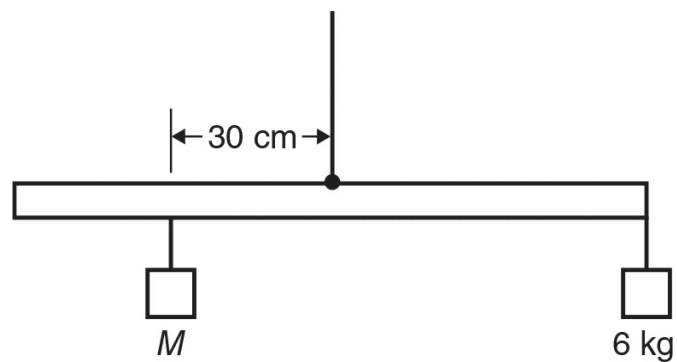
31. Consider the three lenses below.





Which of the above will cause light rays to diverge?

- (A) I only
- (B) II only
- (C) I and II only
- (D) III only
- (E) I, II, and III

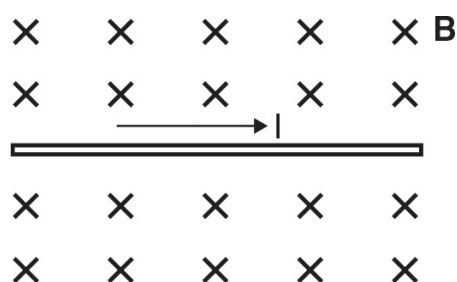


32.

A meter stick of negligible mass is hung from a rope attached to its center, as shown above. A 6 kg mass is hung from one end of the meter stick, and another mass M is hung at a distance of 30 cm from the center of the meter stick, but on the opposite side of the 6 kg mass. What is the value of M ?

- (A) 3 kg
- (B) 5 kg
- (C) 6 kg
- (D) 10 kg
- (E) 30 kg

33.



A wire in the plane of the page carries a current I directed toward the right, as shown. If the wire is located in a uniform magnetic field that is directed into the page, the force on the wire resulting from the magnetic field is

- (A) zero.
- (B) directed out of the page.
- (C) directed to the bottom of the page.
- (D) directed to the left.
- (E) directed to the top of the page.

34. An ideal gas in a closed container initially has a volume V , a pressure P , and Kelvin temperature T . If the temperature is changed to $4T$, which of the following pairs of pressure and volume is possible?

(A) P and V

(B) P and $\frac{1}{2}V$

(C) $4P$ and $4V$

(D) $4P$ and V

(E) $\frac{1}{4}P$ and V

35. A gas in a container absorbs 300 J of heat, then has 100 J of work done on it, then does 50 J of work. The increase in the internal energy of the gas is

(A) 450 J.

(B) 400 J.

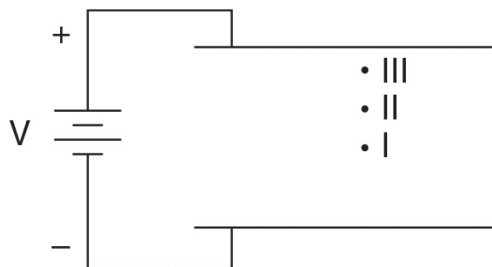
(C) 350 J.

(D) 200 J.

(E) 100 J.

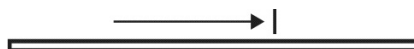
Questions 36–37 refer to the following.

Two large parallel conducting plates are connected to a battery of voltage V , as shown below. Point I is halfway between the plates. Edge effects may be neglected.



36. If a proton is placed at one of the three points above, which of the following statements is true?
- (A) The proton will experience a greater force at point I than at point II.
 - (B) The proton will experience a greater force at point II than at point I.
 - (C) The proton will experience a greater force at point III than at point II.
 - (D) The proton will experience the same force at points I, II, and III.
 - (E) The proton will experience no force at point I.
37. If an electron is placed at one of the three points above, which of the following statements is true?
- (A) The electron will experience a greater upward acceleration at point I than at point II.
 - (B) The electron will experience a greater downward acceleration at point II than at point I.
 - (C) The electron will experience the same upward acceleration at points I, II, and III.

- (D) The electron will experience the same downward acceleration at points I, II, and III.
- (E) The electron will experience no acceleration at points I, II, or III.



38.

•A

The direction of the magnetic field at point A caused by the current I in the wire shown above is

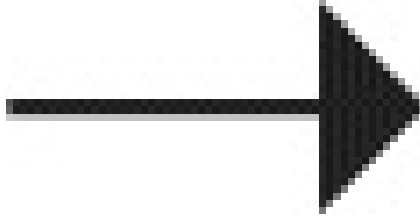
- (A) to the right.
- (B) to the left.
- (C) toward the wire.
- (D) into the page.
- (E) out of the page.

39.

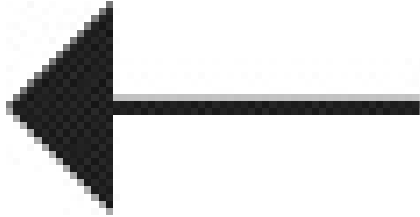


Two long parallel wires are separated by a distance d as shown above. One wire carries a steady current I into the plane of the page, and the other wire carries an equal steady current I that is out of the page. The net magnetic field at a point halfway between the wires points in which of the following directions?

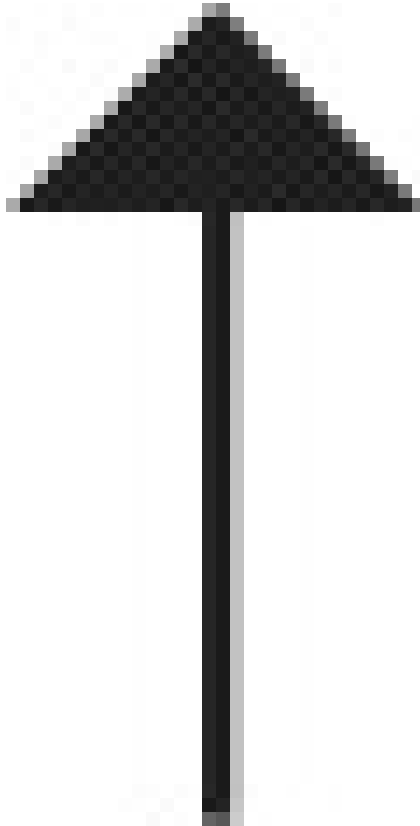
(A)



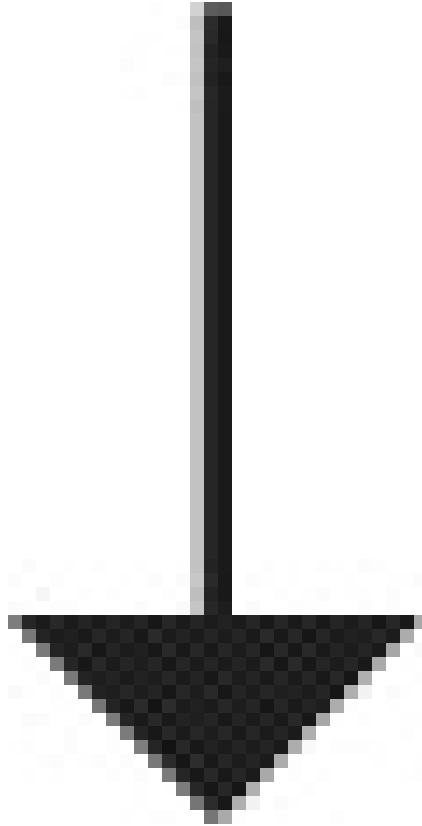
(B)



(C)



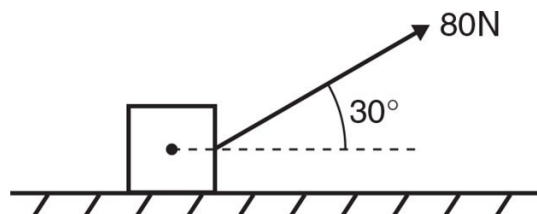
(D)



(E) zero

Questions 40–42 refer to the following.

A block of weight 180 N is pulled along a horizontal surface at a constant speed by a force of 80 N. The force acts at an angle of 30° with the horizontal, as shown below. ($\sin 30^\circ = 0.50$, $\cos 30^\circ = 0.87$)



40. The normal force by the surface on the block is most nearly

- (A) 20 N.
- (B) 40 N.
- (C) 60 N.
- (D) 80 N.
- (E) 140 N.

41. The frictional force acting between the block and the surface is most nearly

- (A) 20 N.
- (B) 40 N.
- (C) 70 N.
- (D) 80 N.
- (E) 92 N.

42. The coefficient of friction between the block and the surface is most nearly

- (A) 5.
- (B) 2.
- (C) 0.87.
- (D) 0.50.
- (E) 0.13.

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