

# PHYSICS TEST

NAME \_\_\_\_\_ DATE \_\_\_\_\_

SCORE \_\_\_\_\_ PERIOD \_\_\_\_\_

You have to decide which one of the suggested answers is correct. Indicate your choice in the answer sheet. Please do not make any marks on this paper. Unless it is otherwise specified, assume: (1) inertial frames of reference, (2) positive electric currents, and (3) work is positive when a gas expands.

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1 ) A block of mass  $M$  is rotating on a rough horizontal surface at the end of a string of length  $L$ . The strength of gravity is  $g$  and the coefficient of friction is  $U$ . If the block has an initial kinetic energy  $E$ , how much work must be done by friction to reduce the speed of the block by 50%?

- (A)  $E/2$                       (B) none of these              (C)  $E/4$   
(D)  $M \cdot g \cdot L/2$               (E)  $3 \cdot E/4$
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2 ) Two horizontal parallel plates are separated 20 cm and connected to a PD of 4,000 V. A +2 mC charge traveling horizontally at a constant speed, enters exactly through the middle of the gap between the plates. If gravity is negligible, what is the gain in kinetic energy by the charge by the time it collides with the negative plate?

- (A) 16 J                      (B) 4 J                      (C) 8 J  
(D) 6 J                      (E) 10 J
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3 ) A battery sends a charge  $Q$  to an electrolytic solution in one hour, resulting in an average current  $I$ . If the same charge is delivered in 5 minutes, what is the new average current?

- (A)  $I/60$                       (B)  $60 \cdot I$                       (C)  $I/5$   
(D)  $12 \cdot I$                       (E)  $5 \cdot I$
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4 ) A glass plate of index of refraction  $3/2$  is covered by a clear film of index of refraction  $6/5$ . If  $L$  is the wavelength of a light ray passing through the film, what should be the new wavelength when traveling through the glass?

- (A)  $5 \cdot L/6$                       (B)  $2 \cdot L/3$                       (C)  $9 \cdot L/5$   
(D)  $4 \cdot L/5$                       (E)  $5 \cdot L/9$
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5 ) A spring having a force constant  $K$  and a mass  $M$  attached, vibrates vertically with a period  $T$  and a maximum amplitude of  $A$  cm. If later the same spring and mass are allowed to vibrate with a maximum amplitude  $A/2$ , what time will the mass take to complete each cycle?

- (A)  $3 \cdot T/4$                       (B)  $T/2$                       (C)  $T$   
(D)  $2 \cdot T/3$                       (E)  $T/4$
- 

6 ) From the edge of a roof 60 m high, a ball is thrown at 40 m/s and at 30 degrees above the horizontal. How long a time later will the ball strike the pavement below?

- (A) 6 s                      (B) 10 s                      (C) 8 s  
(D) 12 s                      (E) 2 s
- 

7 ) The heat capacity at constant volume is  $C_v$  while the heat capacity at a constant pressure is  $C_p$ . How are  $C_p$ ,  $C_v$ , and the Universal gas constant  $R$  related?

- (A)  $R = C_p - C_v$                       (B)  $R = C_v / C_p$                       (C)  $R = C_p + C_v$   
(D)  $R = C_p \cdot C_v$                       (E)  $R = C_p / C_v$
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8 ) A diffraction pattern forms when monochromatic light rays fall perpendicularly on a grating containing 10,000 lines per centimeter.  $D$  is the distance between the central and first order maximums. If another grating of 20,000 lines per cm is used instead, what must be the distance between the first order maximums on both sides?

- (A)  $D/4$                       (B)  $D/2$                       (C)  $2 \cdot D$   
(D)  $4 \cdot D$                       (E)  $D$

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9 ) Three resistors of values 4 ohm, 6 ohm, and 12 ohm are connected in parallel to a battery of voltage  $V$ . The current passing through the battery is  $I$ . How much current goes through the 4 ohm resistor?

- (A)  $I/2$                       (B)  $I/4$                       (C)  $I/3$   
(D)  $I/6$                       (E)  $I/12$
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10 ) A 6 mF capacitor, a 4 ohm resistor, and a 12 ohm resistor are connected in parallel. That combination is then connected to a 12 volt battery. What is the voltage between the plates of the capacitor?

- (A) 4 V                      (B) 12 V                      (C) 3 V  
(D) 2 V                      (E) 0.5 V
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11 ) Three capacitors of values 1 F, 2 F, and 3 F are connected in series to a battery having a voltage of  $n$  volts, where  $n$  is a positive integer. What is the charge in the 2 F capacitor?

- (A)  $6 \cdot n/11$  C                      (B)  $7 \cdot n/13$  C                      (C)  $4 \cdot n/7$  C  
(D)  $5 \cdot n/9$  C                      (E)  $3 \cdot n/8$  C
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12 ) A hollow tube has a length  $L$  and a negligible diameter. When a tuning fork vibrating at the frequency  $f$  is placed near one end of the tube, the air column resonates at the 2nd harmonic mode. The speed of sound in the air inside the tube should be:

- (A)  $L \cdot f/2$                       (B)  $2 \cdot L \cdot f/3$                       (C)  $3 \cdot L \cdot f/5$   
(D)  $L \cdot f$                       (E)  $L \cdot f/3$
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13 ) A certain magnetic flux penetrating a circular loop of radius  $R$  causes the magnetic field strength to be  $B$ . If the same flux goes through another loop of radius  $2R$ , the new magnetic field strength should be:

- (A)  $2 \cdot B$                       (B)  $B/4$                       (C)  $4 \cdot B$   
(D)  $B$                       (E)  $B/12$
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14 ) A glass plate of index of refraction  $3/2$  is covered by a clear film of index of refraction  $6/5$ . Initially traveling in the air, a light ray of wavelength  $L$  is partially reflected and partially refracted at both interfaces air-film and film-glass. What minimum thickness of the film will reflect a minimum into the air?

- (A)  $3.L/10$                       (B)  $L/4$                       (C)  $5.L/24$   
(D)  $L/2$                       (E)  $3.L/20$
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15 ) Two converging lenses, each of focal length 10 cm, are placed straight at the 15-cm and 60-cm marks of a meter stick. If an object is positioned at the 0-cm mark, where on the meter stick will the image produced by the lens on the 60-cm mark appear?

- (A) 80-cm mark                      (B) 90-cm mark                      (C) 50-cm mark  
(D) 70-cm mark                      (E) 75-cm mark
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16 ) A 50-watt light bulb produces an illumination  $E$  at a distance  $R$ . What illumination will produce a 100-watt light bulb at a distance  $2 R$ ?

- (A)  $E/4$                       (B)  $2 \cdot E$                       (C)  $E/2$   
(D)  $4 \cdot E$                       (E)  $E$
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17 ) A 2 ohm and a 3 ohm resistors are connected in series to a 15 V battery. The 3 ohm resistor is situated on the side of the positive terminal of the battery. How much energy is carried by each coulomb of electrons passing through the wire connecting the two resistors?

- (A) 3 J                      (B) 2 J                      (C) 6 J  
(D) 9 J                      (E) 12 J
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18 ) A galvanometer has a resistance of 100 ohm and it requires a current of 500 microamps for a complete deflection. What resistor must be added in order to change the galvanometer into a voltmeter that is capable of measuring a drop in voltage of 1 volt?

- (A) 1,900 ohm                      (B) 50 ohm                      (C) 500 ohm  
(D) 200 ohm                      (E) 5 ohm
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19 ) A mass  $m$  traveling east at the velocity  $v$ , collides head on with a mass  $M$  moving west at the velocity  $V$ . If both masses stick together, how fast will the combined masses should move?

- (A)  $(m \cdot v + M \cdot V)/(m + M)$       (B)  $m \cdot v/(m + M) \cdot V$   
(C)  $(m + M) \cdot V/(M - m)$       (D)  $(m \cdot v - M \cdot V)/(m + M)$   
(E)  $M \cdot V - m \cdot v$
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20 ) A Carnot engine performs 600 cycles per minute. The engine absorbs 600 J of heat during its isothermic expansion and it rejects 200 J of heat during its isothermic compression. What is the maximum power this engine can deliver, assuming no loses to friction?

- (A) 4,000 watts      (B) 2,000 watts      (C) 6,000 watts  
(D) 8,000 watts      (E) 12,000 watts
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\*\*\*\* ANSWER KEY - PHYSICS TEST \*\*\*\*

Exam # EX256.TXT

Physics Module 26

Advanced Placement Physics Exam - Data Bank # 6

The Exam covers the following Subtopic(s):

Mechanics I  
Mechanics II  
Thermodynamics  
Electricity I  
Electricity II  
Optics  
Modern Physics  
Waves  
History of Physics

QUESTION #	ANSWER	DATA BANK QUESTION #
1	E	20
2	B	67
3	D	44
4	D	99
5	C	30
6	A	18

7	-----	A	-----	34
8	-----	D	-----	101
9	-----	A	-----	53
10	-----	B	-----	58
11	-----	A	-----	48
12	-----	D	-----	108
13	-----	B	-----	61
14	-----	C	-----	100
15	-----	B	-----	72
16	-----	C	-----	93
17	-----	D	-----	54
18	-----	A	-----	60
19	-----	D	-----	16
20	-----	A	-----	37