ALBERTA PHYSICS 30 · UNIT B · 25 QUESTIONS

Forces & Fields — Practice Test

This practice test was made by AI and there may be mistakes. If a question or answer looks wrong, use the Flag a mistake button to let Brett know so he can fix it.

1 **A point charge of $+2.0 \times 10^{-6}$ C and a point charge of $+5.0 \times 10^{-6}$ C are separated by a distance of 0.30 m. The magnitude of the electric force that each charge exerts on the other is**

- A 0.30 N
- B 1.0 N
- C 3.0 N
- D 9.0 N

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2 **A test charge of $+2.0 \times 10^{-8}$ C experiences an electric force of 3.6×10^{-5} N at a point in an electric field. The magnitude of the electric field strength at that point is**

- **A** 7.2×10^{-13} N/C
- **B** 5.6×10^{-4} N/C
- **C** 1.8×10^{2} N/C
- **D** 1.8×10^{3} N/C

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3 **Two parallel plates are separated by a distance of 2.0 cm and are connected to a 24 V battery. The magnitude of the electric field between the plates is**

- **A** 0.48 N/C
- **B** 12 N/C
- **C** 1.2×10^{3} N/C
- **D** 2.4×10^{3} N/C

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4 An electron is accelerated from rest through an electric potential difference of 150 V. The kinetic energy gained by the electron, expressed in units of 10^{-17} J and to three significant digits, is

ANSWER _____

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5 A proton moves at a speed of 4.0×10^{5} m/s in a direction perpendicular to a magnetic field of strength 0.25 T. The magnitude of the magnetic force on the proton is

A 1.6×10^{-14} N

B 1.6×10^{-13} N

C 6.4×10^{-14} N

D 4.0×10^{-19} N

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6 **One point charge exerts an electric force of magnitude F on a second point charge. The distance between the charges is then tripled, and the charge on one of the charges is doubled. The magnitude of the new force is**

- **A** $\frac{2}{3}F$
- **B** $\frac{9}{2}F$
- **C** $\frac{1}{9}F$
- **D** $\frac{2}{9}F$

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7 **A bar magnet is moved toward a solenoid. The direction of the induced current in the wire at the top of the solenoid is**

- **A** into the page
- **B** out of the page
- **C** toward the left side of the page
- **D** toward the right side of the page

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8 **The magnitude of the electric field strength at a distance of 0.25 m from a point charge of $+3.2 \times 10^{-6}$ C, expressed in scientific notation, is $a.bc \times 10^{d}$ N/C. Record the values of a, b, c, and d, in order, as a four-digit answer.**

ANSWER

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9 **An external agent moves a charge of $+2.50 \times 10^{-6}$ C from the negative plate of a parallel plate apparatus to the positive plate. The electric potential difference between the plates is 320 V. The work done by the external agent, expressed in scientific notation, is $a.bc \times 10^{-d}$ J. Record the values of a, b, c, and d, in order, as a four-digit answer.**

ANSWER

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10 **A proton moves toward the right side of the page through a magnetic field directed toward the top of the page. The direction of the magnetic force on the proton is**

- **A** into the page
- **B** out of the page
- **C** toward the top of the page
- **D** toward the bottom of the page

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11 **In a Millikan-type apparatus, a charged oil drop that has a mass of 4.9×10^{-15} kg is suspended motionless in an electric field that has a strength of 3.0×10^{4} N/C. The magnitude of the charge on the oil drop is**

- **A** 3.0×10^{-19} C
- **B** 1.6×10^{-19} C
- **C** 1.6×10^{-18} C
- **D** 4.8×10^{-14} C

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12 **An alpha particle ($q = 3.20 \times 10^{-19}$ C, $m = 6.64 \times 10^{-27}$ kg) travels in a circular path that has a radius of 0.150 m in a magnetic field that has a strength of 0.0200 T. The speed of the alpha particle is**

- **A** 1.4×10^{5} m/s
- **B** 7.2×10^{4} m/s
- **C** 2.9×10^{5} m/s
- **D** 1.4×10^{6} m/s

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13 **Three charged spheres are fixed in a straight horizontal line. A charge of $+8.0 \times 10^{-6}$ C is 0.30 m to the left of a charge of $+2.0 \times 10^{-6}$ C, and a charge of -4.0×10^{-6} C is 0.30 m to the right of the $+2.0 \times 10^{-6}$ C charge. The net electric force on the $+2.0 \times 10^{-6}$ C charge is**

- **A** 0.80 N, to the left
- **B** 2.4 N, to the right
- **C** 2.4 N, to the left
- **D** 0.80 N, to the right

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14 **An electron is released from rest beside the negative plate of a parallel plate apparatus and moves toward the positive plate. As the electron moves, its electric potential energy i and its kinetic energy ii. The statement above is completed by the information in row**

A i: increases ii: increases

B i: increases ii: decreases

C i: decreases ii: decreases

D i: decreases ii: increases

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15 **A straight wire that is 0.50 m long carries a current of 2.4 A. The wire is oriented perpendicular to a magnetic field that has a strength of 0.18 T. The magnitude of the magnetic force on the wire, to three significant digits, is ____ N.**

ANSWER _____

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16 **An electron is accelerated from rest through an electric potential difference of 250 V. The final speed of the electron is**

- **A** 4.7×10^{6} m/s
- **B** 1.9×10^{7} m/s
- **C** 9.4×10^{6} m/s
- **D** 8.8×10^{13} m/s

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17 **In a Millikan-type apparatus, an oil drop that has a mass of 9.8×10^{-15} kg is suspended motionless in an electric field that has a strength of 3.0×10^{4} N/C. The number of excess electrons on the oil drop is**

ANSWER _____

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18 **Electric field strength is classified as a i quantity, and electric potential difference is classified as a ii quantity. The statement above is completed by the information in row**

- **A** i: vector ii: vector
- **B** i: vector ii: scalar
- **C** i: scalar ii: vector
- **D** i: scalar ii: scalar

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19 **A charge of $+4.0 \times 10^{-6}$ C and a charge of -4.0×10^{-6} C are separated by a distance of 0.40 m, with the positive charge on the left and the negative charge on the right. The net electric field at the point midway between the charges is**

- **A** 0 N/C
- **B** 9.0×10^{5} N/C, toward the negative
- **C** 1.8×10^{6} N/C, toward the negative
- **D** 1.8×10^{6} N/C, toward the positive

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20 **A long straight wire carries a conventional current vertically upward. At point P, located immediately to the right of the wire, the magnetic field produced by the current in the wire is directed**

- **A** out of the page
- **B** toward the top of the page
- **C** toward the bottom of the page
- **D** into the page

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21 **A proton moves a distance of 4.0 cm in the direction of a uniform electric field that has a strength of 5.0×10^{3} N/C. The work done by the electric field on the proton is**

- **A** 3.2×10^{-17} J
- **B** 3.2×10^{-19} J
- **C** 8.0×10^{-19} J
- **D** 2.0×10^{-16} J

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22 **An electron is placed between two parallel plates where the electric field strength is 1.5×10^3 N/C. The magnitude of the acceleration of the electron, expressed in units of 10^{14} m/s²and to three significant digits, is**

ANSWER

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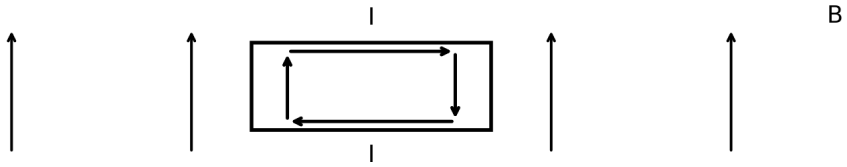
23 **The diagram shows a rectangular loop in a magnetic field directed toward the top of the page. The current in the loop is in the direction shown. The direction of the magnetic force on the top side of the loop is**



A toward the left side of the page

B out of the page

C toward the right side of the page

D into the page

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24 **An electron travels in a circular path that has a radius of 2.0 cm in a magnetic field. The speed of the electron is 3.5×10^{6} m/s. The magnitude of the magnetic field, expressed in scientific notation, is $a.bc \times 10^{-d}$ T. Record the values of a, b, c, and d, in order, as a four-digit answer.**

ANSWER _____

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25 **A positively charged rod is brought into contact with the knob of a neutral electroscope and is then removed. After the rod is removed, the electroscope is i charged, and during the contact, electrons moved ii. The statement above is completed by the information in row**

A. i: positively ii: from the rod onto the electroscope

B. i: negatively ii: from the electroscope onto the rod

C. i: negatively ii: from the rod onto the electroscope

D. i: positively ii: from the electroscope onto the rod

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ANSWER KEY

1. B
2. D
3. C
4. 2.4
5. A
6. D
7. A
8. 4605
9. 8004
10. B
11. C
12. A
13. B
14. D
15. 0.216
16. C
17. 20
18. B
19. C
20. D
21. A
22. 2.63
23. B
24. 9964
25. D

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