ALBERTA PHYSICS 30 · FINAL EXAM · 50 QUESTIONS

Final Exam — 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 5.0 kg cart moving at 6.0 m/s collides with a stationary 5.0 kg cart and sticks to it. The kinetic energy lost in the collision is**

- A 0 J
- B 45 J
- C 90 J
- D 22 J

Understand It with Pulse | Flag a mistake

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

Understand It with Pulse | Flag a mistake

3 **An electromagnetic wave has a frequency of 6.0×10^{14} Hz. Its wavelength in a vacuum is**

- **A** 5.0×10^{-7} m
- **B** 2.0×10^{6} m
- **C** 5.0×10^{-9} m
- **D** 1.8×10^{23} m

Understand It with Pulse | Flag a mistake

4 **When a nucleus undergoes beta negative decay, the change to the nucleus is**

A the atomic number increases by 1 and the mass number is unchanged

B the atomic number decreases by 1 and the mass number is unchanged

C the atomic number decreases by 2 and the mass number decreases by 4

D the atomic number is unchanged and the mass number decreases by 1

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5 **A 1.2 kg ball moving east at 5.0 m/s strikes a wall and rebounds directly west at 3.0 m/s. The magnitude of the change in momentum of the ball is**

A 2.4 kg · m/s

B 9.6 kg · m/s

C 6.0 kg · m/s

D 3.6 kg · m/s

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6 **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

Understand It with Pulse | Flag a mistake

7 **Light travelling in air strikes a flat surface of water (n = 1.33) at an angle of incidence of 40.0°. The angle of refraction, to the nearest tenth of a degree, is ____ degrees.**

ANSWER _____

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8 **An atom has a ground state energy of -8.50 eV and a first excited state energy of -2.30 eV. An electron drops from the first excited state to the ground state. Use $h = 6.63 \times 10^{-34}$ J · s, $c = 3.00 \times 10^{8}$ m/s, and 1 eV = 1.60×10^{-19} J. The wavelength of the emitted photon is**

- **A** 2.00×10^{-7} m
- **B** 5.00×10^{-7} m
- **C** 2.00×10^{-9} m
- **D** 1.24×10^{-6} m

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9 **Two carts rest on a frictionless track with a compressed spring between them. When the spring is released, the 1.2 kg cart moves away at 2.0 m/s. The speed of the 0.80 kg cart, in metres per second, to the nearest tenth, is ____**

ANSWER _____

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10 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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11 In a Michelson-type experiment to measure the speed of light, a rotating mirror with 8 sides is used with a stationary mirror placed 25.0 km away. The light signal is next detected when the rotating mirror has turned through $\frac{1}{8}$ of a revolution during the round trip of the light. The rotation frequency at which this first occurs is

A 750 rev/s

B 375 rev/s

C 1.50×10^{3} rev/s

D 3.00×10^{3} rev/s

Understand It with Pulse | Flag a mistake

12 The nuclear reaction $^{222}_{86}Rn \rightarrow {}^{218}_{84}Po + X$ is balanced when X is

A $^{1}_{0}n$

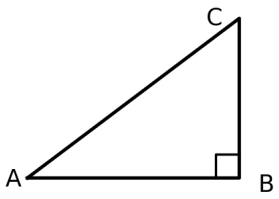
B $^{0}_{-1}e$

C $^{4}_{2}He$

D $^{0}_{+1}e$

Understand It with Pulse | Flag a mistake

13 **The diagram shows the momentum triangle for the combined lump. A 3.0 kg lump of clay moving north at 5.0 m/s collides with a 4.0 kg lump of clay moving east at 5.0 m/s. The two lumps stick together. The speed of the combined lump immediately after the collision is**



A 2.9 m/s

B 5.0 m/s

C 7.1 m/s

D 3.6 m/s

Understand It with Pulse | Flag a mistake

14 **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

Understand It with Pulse | Flag a mistake

15 **An X-ray photon has a wavelength of 2.40×10^{-11} m. The magnitude of the momentum of this photon is (Use $h = 6.63 \times 10^{-34}$ J · s.)**

- **A** 2.76×10^{-23} kg · m/s
- **B** 7.96×10^{-31} kg · m/s
- **C** 2.76×10^{-22} kg · m/s
- **D** 3.62×10^{22} kg · m/s

Understand It with Pulse | Flag a mistake

16 **Cathode rays were found to be deflected by both electric and magnetic fields. This led Thomson to conclude that cathode rays are**

A a form of electromagnetic radiation

B streams of electrically neutral particles

C streams of negatively charged particles

D streams of protons

Understand It with Pulse | Flag a mistake

17 **A 60 kg astronaut floating at rest in space throws a 3.0 kg tool at 8.0 m/s. The speed of the astronaut after throwing the tool, in metres per second, to the nearest hundredth, is ____**

ANSWER _____

Understand It with Pulse | Flag a mistake

18 **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

Understand It with Pulse | Flag a mistake

19 **A ray of light travels in glass that has an index of refraction of 1.52. The critical angle for this glass-to-air boundary is**

A 48.8°

B 41.1°

C 33.0°

D 65.3°

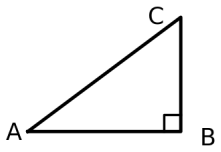
Understand It with Pulse | Flag a mistake

20 The fission reaction $^{238}_{92}U + ^{1}_{0}n \rightarrow ^{99}_{38}Sr + ^{138}_{54}Xe + x\ ^{1}_{0}n$ is balanced when the value of x is

ANSWER _____

Understand It with Pulse | Flag a mistake

21 The diagram shows the momentum triangle for the combined mass. Two 0.50 kg balls collide and stick together. One ball moves east at 4.0 m/s and the other moves north at 3.0 m/s. The direction of the combined mass immediately after the collision, in degrees north of east, to the nearest degree, is ____



ANSWER _____

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22 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 _____

Understand It with Pulse | Flag a mistake

23 **Light with a frequency above the threshold frequency of a metal is shone on the metal. The frequency of the light is then increased while the intensity is kept constant. As a result, the number of photoelectrons emitted per second and the maximum kinetic energy of the photoelectrons will**

- **A** Rate: increases Maximum kinetic energy: increases
- **B** Rate: decreases Maximum kinetic energy: increases
- **C** Rate: decreases Maximum kinetic energy: unchanged
- **D** Rate: unchanged Maximum kinetic energy: increases

Understand It with Pulse | Flag a mistake

24 **An ultraviolet photon has a wavelength of 2.50×10^{-7} m. Use $c = 3.00 \times 10^{8}$ m/s. The frequency of the photon, expressed in the form $a.bc \times 10^{15}$ Hz, has a value of a.bc equal to**

ANSWER _____

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25 **A 65 kg driver is brought to rest from a speed of 14 m/s in 0.25 s by an airbag and seatbelt. The magnitude of the average net force exerted on the driver, in newtons, is ____**

ANSWER _____

Understand It with Pulse | Flag a mistake

26 **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

Understand It with Pulse | Flag a mistake

27 **Diamond has an index of refraction of 2.42. Expressed in the form $a.bc \times 10^{8}$ m/s, the speed of light in diamond has a.bc = ____. (Use c = 3.00×10^{8} m/s in a vacuum.)**

ANSWER _____

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28 **A photon has a wavelength of 434 nm (4.34×10^{-7} m). Use h = 6.63×10^{-34} J · s, c = 3.00×10^{8} m/s, and 1 eV = 1.60×10^{-19} J. The energy of the photon, to the nearest hundredth of an electron volt, is**

ANSWER _____

Understand It with Pulse | Flag a mistake

29 **A 2.0 kg object moving at 8.0 m/s collides with and sticks to a stationary 6.0 kg object. The kinetic energy lost in the collision, in joules, is ____**

ANSWER _____

Understand It with Pulse | Flag a mistake

30 **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 _____

Understand It with Pulse | Flag a mistake

31 **Radiation emitted by a cobalt-60 source has a wavelength of 1.0×10^{-12} m. This radiation is classified as**

A radio waves

B ultraviolet radiation

C X-rays

D gamma rays

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32 **Two nuclei have the same atomic number but different mass numbers. The two nuclei are**

A isobars

B isotopes

C isomers

D ions

Understand It with Pulse | Flag a mistake

33 **A 0.20 kg ball moving at 5.0 m/s strikes a stationary ball of the same mass. After the collision, the first ball moves at 1.0 m/s and the second ball moves at 4.0 m/s, both in the original direction. This collision is best classified as**

A elastic, because both momentum and kinetic energy are conserved

B inelastic, because momentum is conserved but kinetic energy is not

C perfectly inelastic, because the two balls stick together

D impossible, because momentum is not conserved

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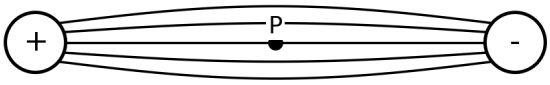
34 **The diagram shows two charged spheres and point P between them. The electric field at point P is directed**



A toward the right side of the page

B toward the left side of the page

C out of the page

D into the page

Understand It with Pulse | Flag a mistake

35 **Total internal reflection can occur when light**

A travels from a lower-index medium into a higher-index medium at any angle of incidence

B travels from a higher-index medium into a lower-index medium at an angle of incidence greater than the critical angle

C travels from a higher-index medium into a lower-index medium at an angle of incidence less than the critical angle

D travels into a medium that has the same index of refraction

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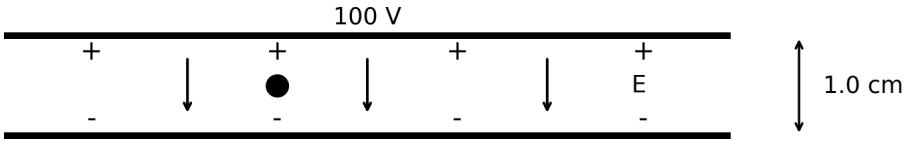
36 **The diagram shows the plates of a Millikan apparatus. A charged oil drop with a mass of 1.63×10^{-15} kg is suspended motionless between the plates. The number of excess electrons on the drop, to the nearest whole number, is ____. (Use $e = 1.60 \times 10^{-19}$ C and $g = 9.8$ m/s².)**



ANSWER _____

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37 **A 0.50 kg cart moving at 4.0 m/s undergoes an elastic collision with an identical stationary cart. The speed of the first cart immediately after the collision is**

- A 2.0 m/s
- B 4.0 m/s
- C 2.8 m/s
- D 0 m/s

Understand It with Pulse | Flag a mistake

38 **An electron moves toward the top of the page through a magnetic field directed out of the page. The direction of the magnetic force on the electron is**

- A toward the right side of the page
- B toward the top of the page
- C toward the left side of the page
- D toward the bottom of the page

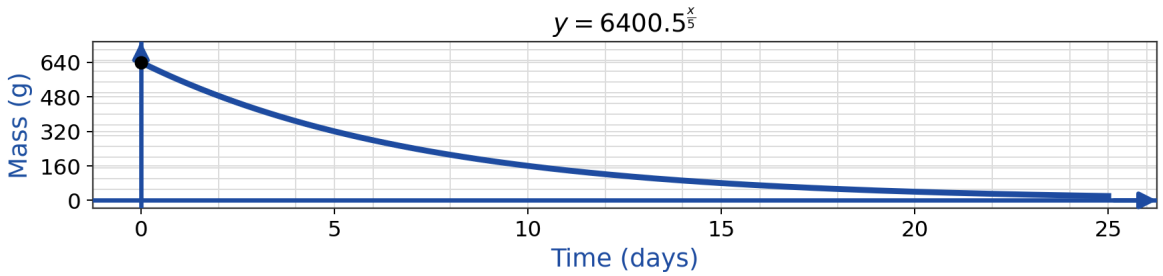
Understand It with Pulse | Flag a mistake

39 **Light travelling in glass (n = 1.50) strikes a boundary with water (n = 1.33) at an angle of incidence of 30.0°. The angle of refraction in the water is**

- **A** 26.4°
- **B** 30.0°
- **C** 34.3°
- **D** 41.8°

Understand It with Pulse | Flag a mistake

40 **The graph shows the mass of a radioactive sample against time. The half-life of the sample, in days, is**



ANSWER

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41 **A 0.30 kg ball moving at 8.0 m/s strikes a stationary ball of the same mass. After the collision the first ball moves at 2.0 m/s and the second ball moves at 6.0 m/s, both in the original direction. The kinetic energy lost in the collision is**

- A 0 J
- B 9.6 J
- C 3.6 J
- D 6.0 J

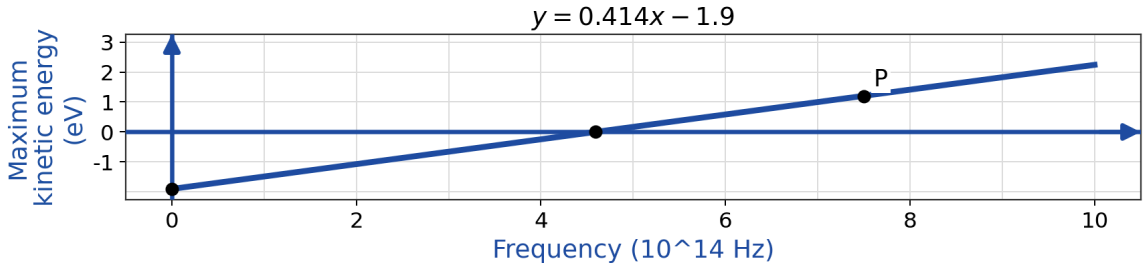
Understand It with Pulse | Flag a mistake

42 **In a Millikan-type apparatus, the parallel plates are separated by 2.0 cm and are connected to a 600 V source. An oil drop that has a mass of 7.34×10^{-15} kg is suspended motionless between the plates. The number of excess electrons on the oil drop is**

ANSWER _____

Understand It with Pulse | Flag a mistake

43 **The graph shows maximum kinetic energy against frequency for a metal, with point P marked on the line. The maximum kinetic energy at point P is**



A 1.20 eV

B 1.91 eV

C 3.10 eV

D 0.60 eV

Understand It with Pulse | Flag a mistake

44 **Light with a wavelength of 4.00×10^{-7} m is incident on a metal with a work function of 2.30 eV. Use $h = 6.63 \times 10^{-34}$ J · s, $c = 3.00 \times 10^{8}$ m/s, and 1 eV = 1.60×10^{-19} J. The maximum kinetic energy of the emitted photoelectrons, to the nearest hundredth of an electron volt, is**

ANSWER

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45 **A 3.0 kg block sliding east at 4.0 m/s collides with a 1.0 kg block sliding north at 4.0 m/s. The blocks stick together. The eastward component of the velocity of the combined blocks, in metres per second, to the nearest tenth, is ____**

ANSWER _____

Understand It with Pulse | Flag a mistake

46 **A charged particle passes undeflected through a region where an electric field of 2.00×10^3 N/C and a magnetic field of 0.500 T are perpendicular to each other and to the velocity of the particle. The speed of the particle, expressed in units of 10^3 m/s and to three significant digits, is**

ANSWER _____

Understand It with Pulse | Flag a mistake

47 **White light is passed through a cool, low-density gas and then through a prism. The spectrum produced by this arrangement will consist of**

- **A** a continuous spectrum that is identical to the spectrum of the original light
- **B** bright coloured lines on a dark background
- **C** dark lines at specific wavelengths against a continuous spectrum
- **D** a continuous spectrum with the red end missing

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48 **Carbon-14 has a half-life of 5730 years. An ancient bone sample contains $\frac{1}{16}$ as much carbon-14 as a living organism. The age of the bone sample, in years, is**

ANSWER _____

Understand It with Pulse | Flag a mistake

49 **A constant net force of 250 N acts on a crate for 0.80 s. The magnitude of the impulse delivered to the crate is**

- **A** 31 N · s
- **B** 3.1×10^{2} N · s
- **C** 20 N · s
- **D** 2.0×10^{2} N · s

Understand It with Pulse | Flag a mistake

50 **A singly ionized atom ($q = 1.60 \times 10^{-19}$ C) that has a mass of 3.32×10^{-26} kg travels in a circular path that has a radius of 0.20 m in a magnetic field that has a strength of 0.50 T. The kinetic energy of the atom is**

- **A** 1.9×10^{-15} J
- **B** 7.7×10^{-15} J
- **C** 1.5×10^{-14} J
- **D** 3.9×10^{-15} J

Understand It with Pulse | Flag a mistake

ANSWER KEY

1.	B	**18.**	D	**35.**	B
2.	D	**19.**	B	**36.**	10
3.	A	**20.**	2	**37.**	D
4.	A	**21.**	37	**38.**	C
5.	B	**22.**	20	**39.**	C
6.	A	**23.**	B	**40.**	5
7.	28.9	**24.**	1.2	**41.**	C
8.	A	**25.**	3640	**42.**	15
9.	3	**26.**	A	**43.**	A
10.	4605	**27.**	1.24	**44.**	0.81
11.	A	**28.**	2.86	**45.**	3
12.	C	**29.**	48	**46.**	4
13.	D	**30.**	9964	**47.**	C
14.	C	**31.**	D	**48.**	22920
15.	A	**32.**	B	**49.**	D
16.	C	**33.**	B	**50.**	D
17.	0.4	**34.**	A		

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