PHY 181: Summer 2023
Final exam sample problems

Useful facts

This section **does not** contain all that you need to know for the test.

$m_{electron} = 9.109\text{x}10^{-31}\text{kg}$ $\qquad$ g = 9.8 m/s^2

$$\Delta x = x_f - x_i \quad x_f = \Delta x + x_i \quad x_i = x_f - \Delta x$$

$$|\vec{F}_f| = \mu \vec{F}_N \qquad \mu = \frac{|\vec{F}_f|}{|\vec{F}_N|} \qquad \vec{F}_N = \frac{\vec{F}_f}{\mu}$$

$$\vec{p} = m\vec{v} \qquad \vec{v} = \frac{\vec{p}}{m} \qquad m = \frac{\vec{p}}{\vec{v}}$$

$$\vec{J} = \vec{F}\Delta t \qquad \vec{F} = \frac{\vec{J}}{\Delta t} \qquad \Delta t = \frac{\vec{J}}{\vec{F}}$$

$$\vec{J} = \Delta\vec{p} \qquad W = \Delta E$$

$$W = |\vec{F}||\vec{d}| \qquad |\vec{F}| = \frac{W}{|\vec{d}|} \qquad |\vec{d}| = \frac{W}{|\vec{F}|}$$

$$P = \frac{W}{\Delta t} \qquad W = P\Delta t \qquad \Delta t = \frac{W}{P}$$

$$v = \sqrt{\frac{2E_k}{m}}$$

Questions 1 to 3 refer to the table below.
Using the relationship between normal force and friction force, fill in the table below.

$\lvert F_N\rvert$ (N)	μ	$\lvert F_f\rvert$ (N)
10	0.2	A
96	B	8
C	0.8	80

1: What is the value of field A?

2: What is the value of field B?

3: What is the value of field C?

4: Suppose that an object with a weight of 980lbf downward and a kinetic coefficient of friction of 0.75 is being pulled with a force of 700lbf horizontally. If the object is currently in motion on a flat surface, will the object remain in motion? (4 points)

Questions 5 to 7 refer to the table below.
Using the definition of momentum, complete the table below.

m (kg)	$\vec{v}$ (m/s North)	$\vec{p}$ (Ns North)
3	9	D
8	E	96
F	15	90

5: What is D? (2 points)

6: What is E? (2 points)

7: What is F? (2 points)

8: Suppose that electrons are accelerated up to 5.0x10^{6}m/s. What is the magnitude of the momentum of an electron at this speed? (Ignore relativistic effects.) (5 points)

Questions 9 to 12 refer to the table below.
Use the relationship between impulse and momentum to fill in the chart below. The direction in all vectors is Northward.

$\vec{F}$ (N)	Δt (s)	$\vec{J}$ (N·s)	$\vec{p_f}$ (N·s)	$\vec{p_i}$ (N·s)
8	3	G	H	12
9	I	81	-8	J

9: What is the value for field G? (2 points)

10: What is the value for field H? (2 points)

11: What is the value for field I? (2 points)

12: What is the value for field J? (2 points)

Questions 13 to 14 refer to the chart below.
Fill in the chart below.

$\lvert\vec{F}\rvert$ (N)	Δd (m)	W (J)
700	5	K
400	L	3200

13: What is the value for field K? (2 points)

14: What is the value for field L? (2 points)

Questions 15 to 22 refer to the chart below. Suppose you throw a 2kg cannonball off a bridge. The bridge is 20m tall. Note that the initial velocity is not zero. All vectors point downward. Take a height of zero to refer to the height moments before impact. Ignore air resistance.

Δh (m)	$\vec{v}$ (m/s)	E_p (J)	E_k (J)	E_T (J)
20	4	M	N	P
10	—	Q	R	S
0	V	T	U	—

15: What is the value for field M? (2 points)

16: What is the value for field N? (2 points)

17: What is the value for field P? (2 points)

18: What is the value for field Q? (2 points)

19: What is the value for field R? (2 points)

20: What is the value for field S? (2 points)

21: What is the value for field T? (2 points)

22: What is the value for field U? (2 points)

23: What is the value for field V (2 points)

Questions 24 to 25 refer to the chart below. Note that the first column is work with units of Joules. The third column is power with units of Watts.

W (J)	Δ t (s)	P (W)
300	2	W
40	X	5

24: What is the value for field W? (2 points)

25: What is the value for field X? (2 points)

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1. 2
2. 0.083
3. 100
4. $|F_{kf}| = 735$ lbf. Therefore, the object will not remain in motion.
5. 27
6. 12
7. 6
8. 4.5545x10^{-24} N·s
9. 24
10. 36
11. 9
12. -89
13. 3500
14. 8
15. 392
16. 16
17. 408
18. 196
19. 212
20. 408
21. 0
22. 20.2
23. 150
24. 8