Physics 12 - Review
Unit 8 Provincial Package

1. A square coil is perpendicular to a uniform magnetic field. Which one of the following would **increase** the magnetic flux through the coil?

   A. Decreasing the area of the coil.
   B. Increasing the number of loops in the coil.
   C. Removing the coil from the magnetic field.
   D. Increasing the strength of the magnetic field.

2. A coil of wire of area $1.5 \times 10^{-3}\ m^2$ consists of 40 loops. A magnetic field is perpendicular to the face of the coil. In a period of 0.20 s the strength of the magnetic field decreases from 0.060T to0.050T in the same direction. What is the average emf induced in the coil during this time?

   A. 7.5×10^{-5} V
   B. 1.5×10^{-3} V
   C. 3.0×10^{-3} V
   D. 3.3×10^{-2} V

3. The current in an electric motor running at full speed is 2.5 A when connected to an 80 V dc source. If the armature resistance of the motor is 4.0 Ω, what is the back emf at this speed?

   A. 0 V
   B. 10 V
   C. 70 V
   D. 90 V

4. An ideal transformer has 150 turns in the primary coil and 1 800 turns in the secondary coil. If the primary coil is connected to 120 V ac and draws 7.5 A of current, what is the current in the secondary coil?

   A. 0.63 A
   B. 7.5 A
   C. 16 A
   D. 90 A

5. Which one of the following **best** describes a step-up transformer? [primary circuit: p; secondarycircuit: s]

	VOLTAGE	CURRENT
A.	$V_p > V_s$	$I_p > I_s$
B.	$V_p > V_s$	$I_p < I_s$
C.	$V_p < V_s$	$I_p > I_s$
D.	$V_p < V_s$	$I_p < I_s$

6. Which of the following is a statement of Lenz's law?

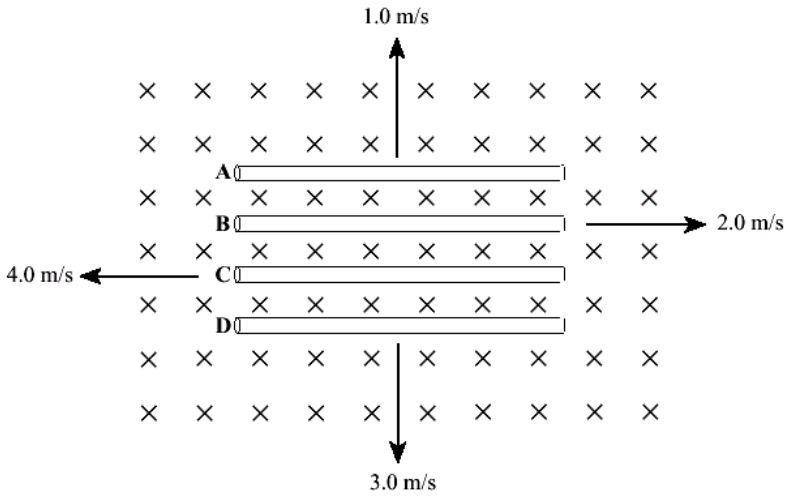
   A. The number of magnetic lines perpendicular to the surface area enclosed by a circuit is equal to the flux.

   B. An induced current in a closed conducting loop will appear in such a direction that it opposes the change that created it.

   C. An emf is produced between the ends of a straight wire when the wire is moving perpendicularly through a uniform magnetic field.

   D. The average emf induced in a circuit is proportional to the rate of change of the magnetic flux through that circuit.

7. Four conductors of equal length are each moved through a uniform magnetic field in different directions and with different speeds, as shown.



While the four conductors are being moved through the field, in which conductor will the largest potential difference be induced?

A. Conductor A
B. Conductor B
C. Conductor C
D. Conductor D

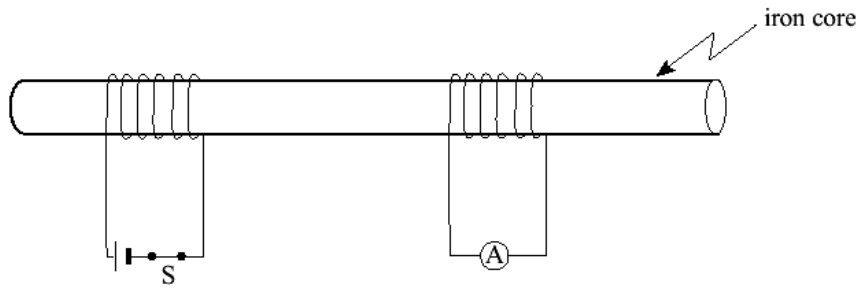
8. A 75-turn square coil of wire, 0.12 m on a side, is in a 4.5×10^{-2} T magnetic field. The field is perpendicular to the coil. If the coil of wire is removed from the field in 0.10 s, what average emf is induced in the coil?

A. 6.5×10^{-3} V
B. 1.2×10^{-1} V
C. 2.4×10^{-1} V
D. 4.9×10^{-1} V

9. A 2.5 m wire moves 77 m/s perpendicular to a uniform 3.8×10^{-6} T magnetic field. What potential difference is induced across the ends of this wire?

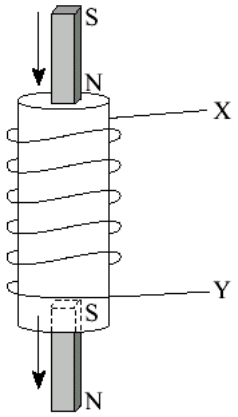
A. 0 V
B. 1.6×10^{-19} V
C. 2.0×10^{-8} V
D. 7.3×10^{-4} V

10. In the following diagram, ammeter A shows a current



A. while switch S remains closed.
B. while switch S remains opened.
C. only while switch S is being closed.
D. while switch S is being opened or being closed.

11. A bar magnet is dropped through a solenoid, as shown.



What is the direction of the induced current in the solenoid as the magnet enters the top (i) and as the magnet leaves the bottom (ii)?

	(i) ENTERS TOP	(ii) LEAVES BOTTOM
A.	From X to Y	From X to Y
B.	From X to Y	From Y to X
C.	From Y to X	From Y to X
D.	From Y to X	From X to Y

12. A transformer has four times as many turns on the secondary as on the primary. If the primary voltage is 120 V ac, which of the following describes the transformer?

	SECONDARY VOLTAGE	TYPE
A.	30 V ac	step down
B.	30 V ac	step up
C.	480 V ac	step down
D.	480 V ac	step up

13. A transformer connected to a 120 V ac source has an output of 24 V ac. If the primary coil has 330 turns, how many turns of wire are there in the secondary coil?

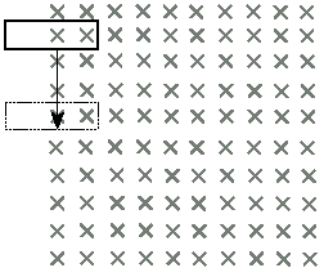
A. 24 turns
B. 66 turns
C. 330 turns
D. 1 650 turns

14. A dc motor is connected to a constant voltage supply. The load on the motor decreases, allowing the motor to rotate faster. How do the back emf and current through the motor change?

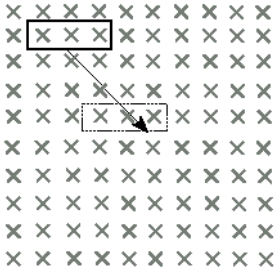
	BACK EMF	CURRENT
A.	decreases	decreases
B.	decreases	increases
C.	increases	decreases
D.	increases	increases

15. In which of the following situations would an induced emf be produced in a rectangular loop of wire? The loop of wire is moved as indicated.

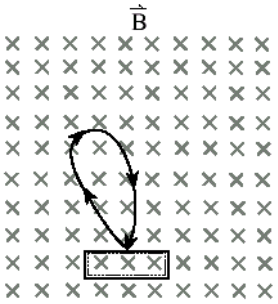
A.



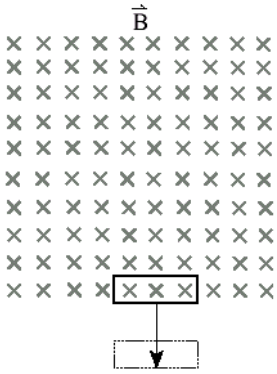
B.



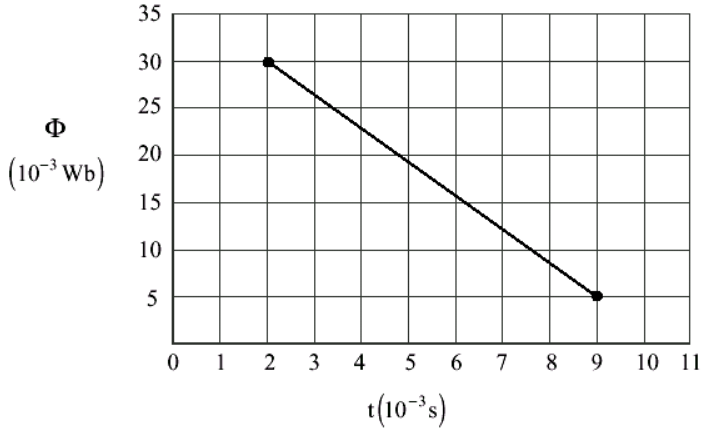
C.



D.



16. The graph below shows how the magnetic flux through a single loop changes with respect to time.



What is the average emf induced between $t = 2.0\times10^{-3}$ s and $t = 9.0\times10^{-3}$ s?

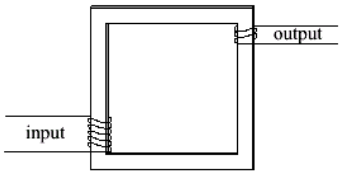
A. 1.2×10^{-4} V
B. 1.8 V
C. 3.6 V
D. 25 V

17. For what type of input current will the output current in a transformer be zero?

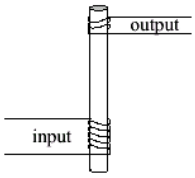
A. dc
B. ac
C. increasing dc
D. decreasing dc

18. Which of the following is a step-up transformer?

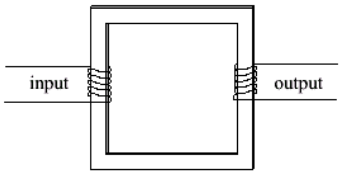
A.



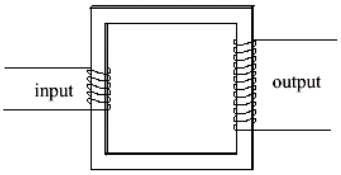
B.



C.



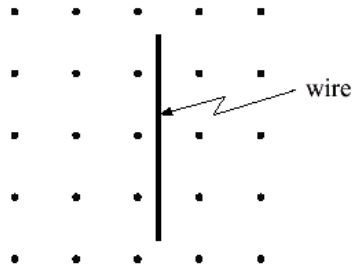
D.



19. A motor designed to operate on 120 V draws a current of 33 A when it first starts up. At its normal operating speed, the motor draws a current of 2.7 A. What is the back emf at normal operating speed?

A. 9.8 V
B. 110 V
C. 120 V
D. 130 V

20. A wire is in a magnetic field as shown.



In which direction could the wire be moved to induce an emf across the length of the wire'

A. to the left
B. up the page
C. into the page
D. down the page

21. An emf is induced in a coil if the magnetic flux through the coil is

A. zero.
B. changing.
C. constant and large.
D. constant and small.

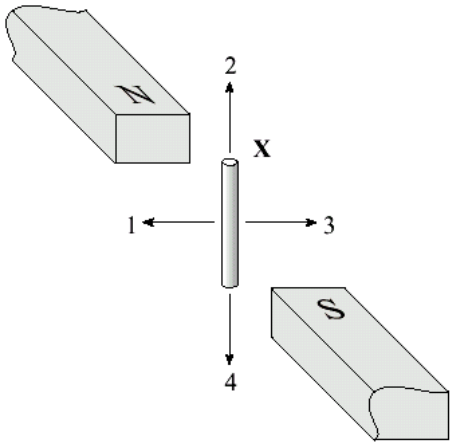
22. A coil of wire contains 55 loops. The coil is rotated such that the flux changes from 2.0×10^{-4} Wb to 8.0×10^{-4} Wb in 1.5×10^{-2} s. What is the average induced emf?

A. 1.1 V
B. 1.8 V
C. 2.2 V
D. 3.7 V

23. A door bell transformer has 900 primary windings and 60 secondary windings. The secondary current is 0.30 A. What is the primary current and what is the type of transformer?

	PRIMARY CURRENT (A)	TRANSFORMER TYPE
A.	0.020	Step-Up
B.	0.020	Step-Down
C.	4.5	Step-Up
D.	4.5	Step-Down

24. A conductor is initially at rest in a magnetic field.



In which direction should the conductor be moved so that the end nearest **X** becomes positive?

A. 1
B. 2
C. 3
D. 4

25. A coil of 150 turns and an area of 2.0×10^{-4} m^2 is placed in a 1.00 T magnetic field as shown in Diagram I.

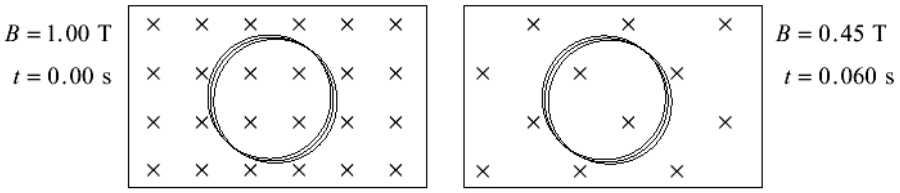


Diagram I Diagram II

If this field changes to 0.45 T in 0.060 s, what is the average emf induced in the coil and in what direction does the induced current flow?

	INDUCED EMF (V)	CURRENT DIRECTION
A.	0.28	Clockwise
B.	0.28	Counterclockwise
C.	0.36	Clockwise
D.	0.36	Counterclockwise

26. A dc motor has an armature resistance of $3.0\ \Omega$. When connected to a 24 V source the motor draws 1.4 A at maximum speed. What is the back emf produced by the motor at maximum speed?

A. 4.2 V
B. 20 V
C. 24 V
D. 28 V

27. A soldering iron transformer has 200 primary turns and 5 secondary turns. The primary draws 0.80 A at 120 V. Which of the following gives the secondary current and secondary voltage?

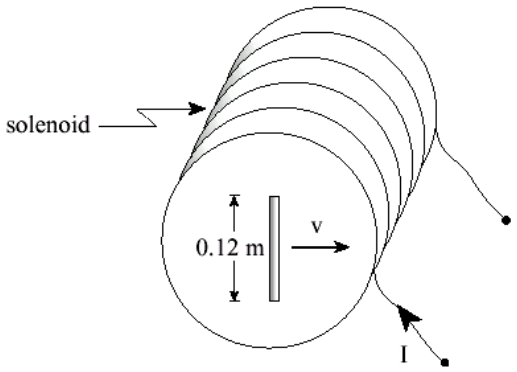
	SECONDARY CURRENT	SECONDARY VOLTAGE
A.	0.020 A	4 800 V
B.	0.80 A	120 V
C.	4.0 A	24 V
D.	32 A	3.0 V

28. A motor is connected to 117 V and draws a current of 32.5 A when it first starts up. At its normal operating speed, the motor draws a current of 4.20 A.

a) What is the resistance of the armature coil? **(3 marks)**
b) What is the back emf developed at normal operating speed? **(4 marks)**

29. When an electric drill turns at normal operating speeds, there is little heat produced in the motor windings. When drilling harder material, the drill motor turns much slower than normal and overheats. Using principles of physics, give an explanation for the increased heat in the windings. **(4 marks)**

30. A solenoid of length 0.85 m has a radius of 0.10 m. A current of 25 A flows through its 7 600 turns. Within this solenoid, a 0.12 m wire moves as shown and develops an emf of 0.055 V across its ends.



With what speed does the wire move perpendicular to the solenoid's magnetic field? **(7 marks)**

31. a) A 16.0 V power supply is used to run a dc motor. When the motor is jammed so that it cannot turn, it draws a current of 12.0 A. What is the back or counter emf when the motor runs freely, drawing a current of 2.50 A? **(5 marks)**

b) Using principles of physics, explain why the motor draws a much higher current when jammed than when running freely. **(4 marks)**

KEY

1. D
2. C
3. C
4. A
5. C
6. B
7. D
8. D
9. D
10. D
11. B
12. D
13. B
14. C
15. D
16. C
17. A
18. D
19. B
20. A
21. B
22. C
23. B
24. A
25. A
26. B
27. D

28. a) 3.6Ω
    b) 102 V
29. When the motor moves slower there is less induced back EMF, this causes the overall voltage in the motor to increase which means higher current due to Ohm's law (since resistance hasn't changed). Larger current will produce more power and heat energy.
30. 1.63 m/s
31. a) 12.7 V
    b) When jammed there is no change in flux so no back EMF is induced, which leads to higher total voltage in the system and larger current due to Ohm's law(since resistance is constant)