# Science Practice Exam

## Chapters 5 and 14

## FORMULAS

Science and Technology

| FORMULAS | |
|---|---|
| $C = \dfrac{m}{v}$    C: concentration <br><br>     m: quantity of solute <br>     v: quantity of solution <br><br><br> $V = RI$    V: potential difference <br>     R: resistance <br>     I: electric current intensity | $P = VI$     P: electrical power <br>      V: potential difference <br>      I: electric current intensity <br><br><br> $E = P\Delta t$    E: energy consumed <br>      P: electrical power <br>      Δt: time difference |

$$\text{Energy efficiency} = \frac{\text{Amount of useful energy}}{\text{Amount of energy consumed}} \times 100$$

1.  Which pair of substances can be used as conductors in an electric circuit?

A)   Aluminum and copper                      C)   Copper and glass

B)   Aluminum and porcelain                   D)   Porcelain and glass

2.  Four charged spheres A, B, C and D are suspended from wires. The following diagrams show what happens when these spheres are suspended in pairs close to each other.
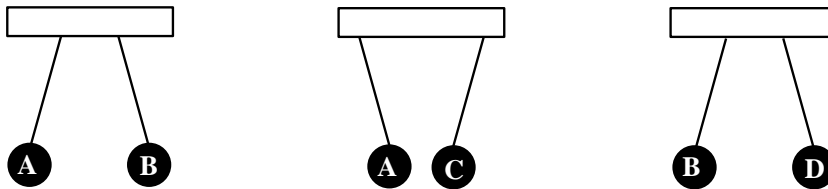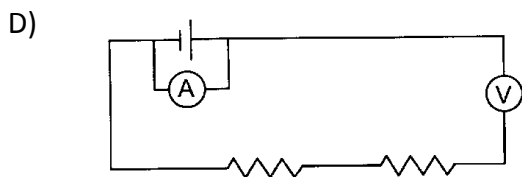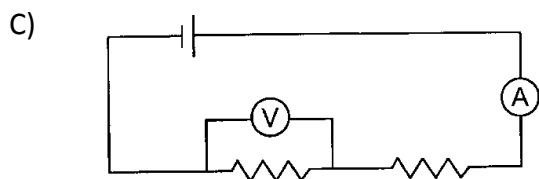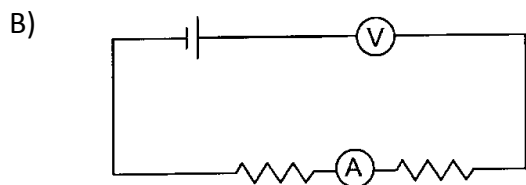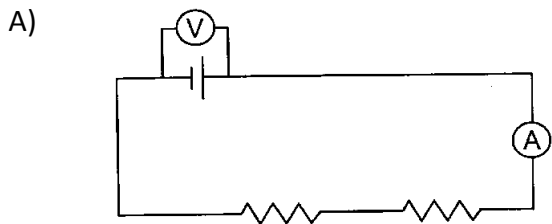


Spheres A and D are suspended close to each other, as are spheres B and C. Which of the following pairs of diagrams correctly shows what will happen to these spheres?

A)



B)



C)



D)

**3.** The resistance of a heating element is 10 Ω and the potential difference (voltage) across its terminals is 240 V. This element is used for 3 hours.

How much electric energy was used during this period?

A)    17.3 kJ

C)    17 280.0 kJ

B)    108.00 kJ

D)    62 208.0 kJ

**4.** Aramis uses an electric mixer to whip some cream in a mixing bowl. The power of the motor is 10 W. After using the mixer for 5 min, he calculates that the cream has absorbed 1200 J of thermal and mechanical energy.

What amount of electrical energy used by the motor was not absorbed by the cream?

A)    50 J

B)    1 150 J

C)    1 800 J

D)    3 000 J

**5.** You are asked to build an electric circuit consisting of a wire, a light bulb and a power source. You want the light produced to be as bright as possible. If the following wires are the same diameter, which one would you use?

A)    Nichrome wire 1 m long

B)    Copper wire 1 m long

C)    Nichrome wire 5 m long

D)    Copper wire 5 m long

6. **Which of the following best describes the relationship between conductors and insulators?**
   a) A conductor permits the free flow of electrical charges while an insulator slows or stops the free flow of electrical charges.
   b) A conductor slows or stops the free flow of electrical charges while an insulator permits the free flow of electrical charges.
   c) Conductors and Insulators both permit the free flow of electrical charges.
   d) Conductors and insulators both slow or stop the free flow of electrical charges.


7. Examine the four electric circuits below. Each consists of a power supply, two resistors, an ammeter Ⓐ and a voltmeter Ⓥ. You wish to measure the potential difference across the terminals of the power supply as well as the total current intensity of the circuit. In which circuit are the voltmeter and the ammeter correctly connected?

A)



B)



C)



D)

8. Four objects W, X, Y and Z were brought close together two at a time.  One of these objects is magnetic, one is nonmagnetic and two are ferromagnetic.  The results were as follows:

| OBJECTS | RESULT |
|---------|--------|
| W and X | The objects attracted each other. |
| X and Y | The objects attracted each other. |
| W and Y | Nothing happened. |
| X and Z | Nothing happened. |

Which of these objects is nonmagnetic?

A)   W

B)   X

C)   Y

D)   Z

9. Two magnets are placed side by side.

Which of the following diagrams correctly represents the magnetic fields produced by these magnets?

A)

N   S   N   S

B)

S   N   N   S

C)

S   N   S   N

D)

N   S   S   N

**10.** The electric current passing through a resistor has been measured for different voltages. The following graph shows the results.
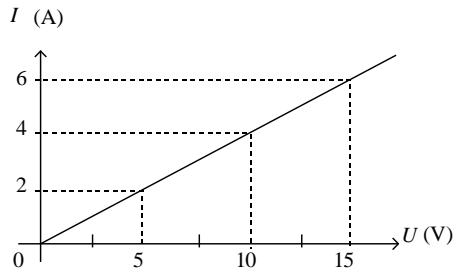


What is the value of the resistance of the resistor?

A)    0.40 Ω

B)    2.5 Ω

C)    10 Ω

D)    90 Ω


**11.** A voltage of 100 V, is applied to the ends of a metal conductor for 20 seconds. The current passing through this conductor is 5.0 A.

What is the resistance of the metal conductor?

A)    400 Ω

B)    100 Ω

C)    20 Ω

D)    1 Ω

**12.** Which of the following is **NOT** something you would do to increase the strength of a conductor?

A)    Change the material from iron to copper     C)    Increase the length of the w

B)    Increase the diameter of the wire         D)    Decrease the length of the ν

**13.** Which if the following is the electrical function performed by fuses and breakers in a circuit?

A)    Protection                                C)    Transformation of energy

B)    Control                                   D)    Conduction

**14.** The following circuit to the right is given to you on a lab exam. You are asked to correctly place an ammeter in the circuit so that you are able to read the current flowing through resistor $R_2$.
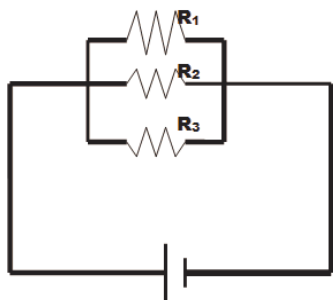


Which diagram shows where the ammeter should be placed?

A)



B)



C)



D)
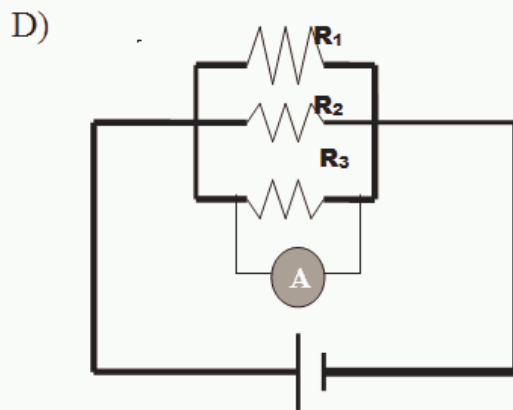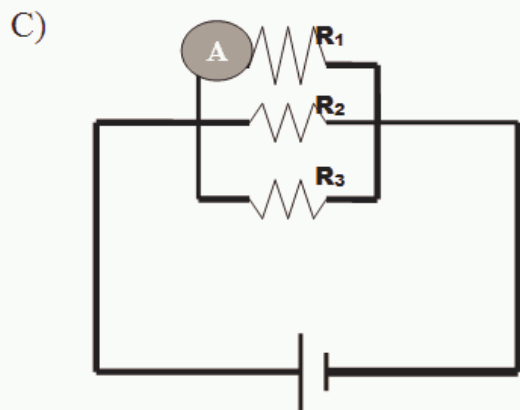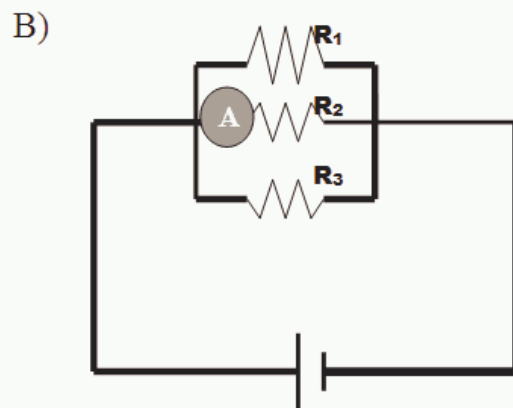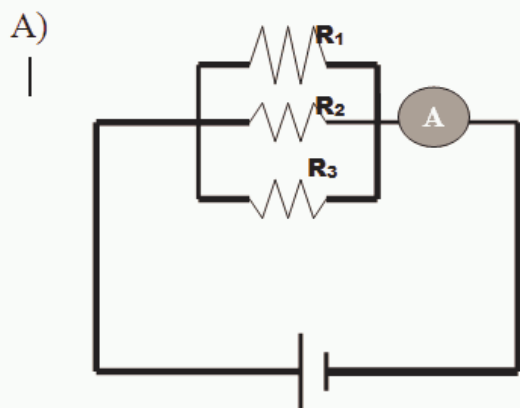
**15.** In the laboratory, you are given three different substances :

1. a magnetic substance
2. a ferromagnetic substance
3. a non-magnetic substance

You bring these substances close to one another and note your observations. Which of the following observations is correct?

A)   Substances 1 and 2 repeal each other.

B)   Substances 1 and 2 attract each other.

C)   Substances 1 and 3 attract each other.

D)   Substances 2 and 3 attract each other.


## Long Answer (Show work on a lined sheet of paper!!)

**16.** Calculate the intensity of a circuit with a potential difference of 12V and a resistance of 4 Ω.

**17.** Draw a parallel circuit with 2 light bulbs, a power supply and a resistor.

**18.** An electrical appliance is used for 45 minutes and consumes 900 kJ of energy. What is the electrical power of this appliance?

**19.** What is the direction of convention current flow?

**20.** A 2000 W heater is turned on for 4 hours. How much energy is used in kWh?

**21.** When we rub a glass rod with silk, the rod becomes electrically charged. What happens during the rubbing process?

**22.** A current of 300 mA flows through a circuit. Its resistance is 100 Ω. What is the voltage of the power supply?

**23.** A 250 W kettle is used for 30 minutes a day. How many kJ of energy does it consume in one month (30 days)?

**24.** The resistance of a heater sold on amazon.ca is 50 Ω. Its voltage is 120 V. Find its power in watts.

**25.** A coffee maker is connected to a 220 V outlet. The resistance of the heating element of the coffee maker is 30 Ω. This coffee maker works for 15 minutes.

a) How much energy in joules is used by the heating element of the coffee maker during this period?

b) How much will it cost to operate the coffee maker every year if it's used 15 minutes per day in a year (365 days)? Cost = $0.05/kwh.