Name: _____ Date:_____

Take your time to understand the questions. Read the words properly and annotate wherever needed.

1. Ion X^{2+} has 10 electrons. Which of the following could be element X?
   a. Neon
   b. Magnesium
   c. Beryllium
   d. Sodium

2. Atom P has 13 protons while atom Q has 8 protons. Which of the following could be a possible stable compound formed by P and Q?
   a. PQ
   b. PQ_3
   c. P_2Q_3
   d. P_2Q

3. When substance Y reacted with hydrochloric acid, a gas was given off that had no effect in limewater but extinguished a burning splint with a pop sound. What could Y be?
   a. Calcium carbonate
   b. Calcium hydroxide
   c. Calcium
   d. Calcium oxide

4. The table shows information about 3 indicators

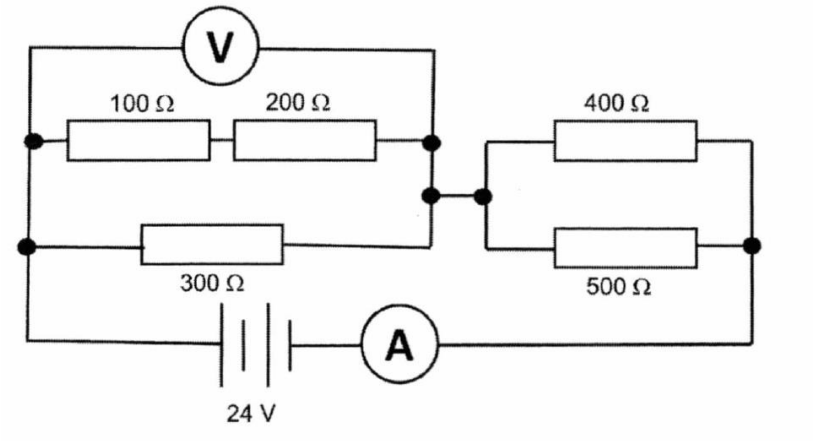
indicator	colour at pH 1	pH at which colour changes	colour at pH 12
congo red	blue	5	red
thymol blue	red	3	yellow
phenolphthalein	colourless	10	pink

Each indicator was added to separate sample of distilled water.

Which colour would be obtained for each indicator?

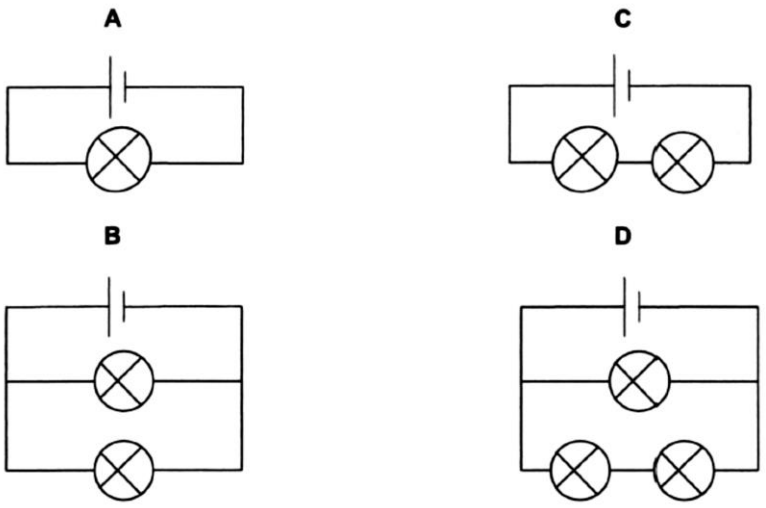
	congo red	thymol blue	phenolphthalein
A	blue	red	pink
B	blue	yellow	colourless
C	red	yellow	pink
D	red	yellow	colourless

The figure below shows an electric circuit. Use it to answer question 5, 6, and 7

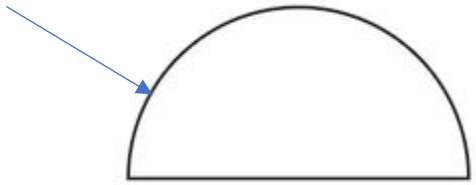


5. Determine the reading of the ammeter.
    a. 0.0645 A
    b. 0.0160 A
    c. 1050 A
    d. 2.16 A
6. Determine the reading of the voltmeter.
    a. 9.680 V
    b. 19.35 V
    c. 24 V
    d. 2.4 V
7. Determine the current that flows through the 400 ohms resistor.
    a. 0.0645 A
    b. 0.0358 A
    c. 525 A
    d. 1.08 A

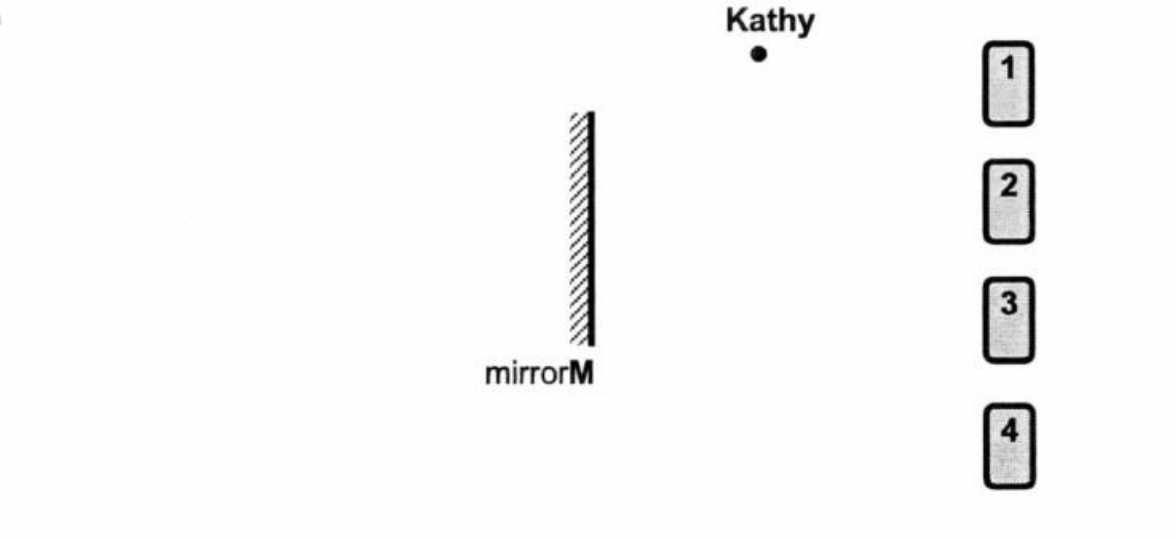
8. The following lamps and electrical cells are identical. Which circuit has the lowest effective resistance?



9. A light ray enters a semi-circle glass block in the following direction. It is heading towards the center of the semi-circle glass block. Complete the path of the light ray as it exits glass block.



10. Kathy is seated near Mirror M as shown in the figure below.
There are 4 seats (1,2,3,4) in front of the mirror M and Lisa is asked to take a seat at any one of them.



Which of the seats should Lisa take such that she can see an image of Kathy in the mirror?

a. Seats 1 & 2
b. Seats 3 & 4
c. Seat 4
d. Seat 3

A Parting Note

I hope you had fun doing these questions! This is what we do in Aspire Thinking – we take a look at questions that challenge our understanding of concepts and we discuss about them in class.

Over time, doubts and misunderstandings get cleared and we become more familiar with laws, formulae and applications. As a result, we get better at answering questions and thus, students score a better grade over time.

Keep looking for challenging questions to do and discuss them with your teachers or friends. Or you can come for our classes as well. Every time you work on questions, you are one step closer to scoring better.

In the next page, you will the answer key with brief explanation. Read the explanation thoroughly, especially for those questions that were answered wrongly. Sometimes you may need to read more than once. That is normal. At the end of it, you will feel yourself becoming more familiar with topic and that is what learning is about.

Ans Key with Brief Explanation

1. B. Since the ion of X has 10 electrons with charge of 2+, the atom of X must have lost 2 electrons. Thus, atom X has 12 electrons which also means it has 12 protons. From the periodic table, the atom of an element that has 12 electrons is magnesium.

2. C. The electron configuration of P is 2.8.3 while the electron configuration of Q is 2.6. This means P needs to give away 3 electrons while Q needs to take in 2 electrons. P will therefore become an with charge 3+ and Q will be 2-.

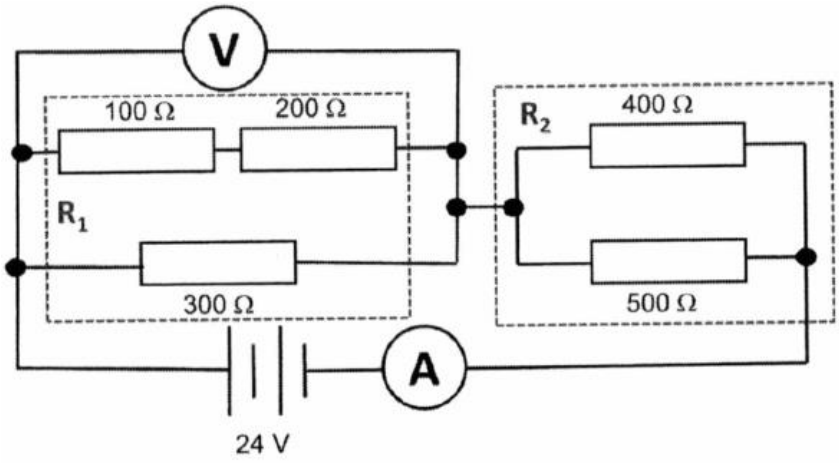
   P^{3+} Q^{2-}

   The key is to make sure the sum of their charges cancels out in order for the compound to be stable. By applying the principles of lowest common multiple, it takes 2 P^{3+} and $3Q^{2-}$ to cancel each others' charges out. Therefore, only option C can be the answer.

3. C. Based on the observation, the gas given off is hydrogen and is definitely not carbon dioxide. C is the only that makes sense as metals react with acids to produce salt and hydrogen gas.

4. D. The pH level of distilled water is 7. Based on Congo Red, the color at pH 7 would be red. If we apply the same reason to the other 2 indicators, D would be the answer.

5. A. We will need to apply parallel and series resistance based on the diagram below:



$R_1 = 1/[1/300 + 1/(100 + 200)] = 150\ \Omega$

Shortcut: if both branches have equal resistance, their effective resistance is halved.

Since R1 and R2 are in series,

$R_{eff} = R_1 + R_2 = 150 + 1/(1/400 + 1/500) = 372\ \Omega$

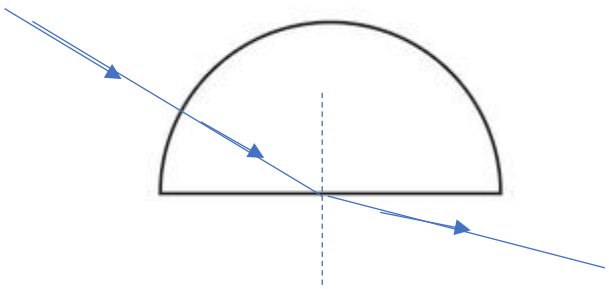
Applying I = V/Reff,
I = 24 / 372 = 0.0645 A

6. A. Since we know the effective resistance of R1, we can use V=IR:
V = 0.064516 x 150 = 9.68 V

7. B. Since PD across R1 is 9.68, PD across R2 = 24 – 9.68 = 14.32 V
Applying I = V/R, $I_{400\Omega}$ = 14.32/400 = 0.0358 A.

8. B. We can use algebra to solve then. Let resistance of lamp be R. For option A, the effective resistance is R. For B, it's R/2 [$or\ \left(\frac{1}{R}+\frac{1}{R}\right)^{-1}$] . For C, it's R+R = 2R. For D, it's 2R/3 [$or\ (\frac{1}{R}+\frac{1}{2R})^{-1}$] . Therefore, B has the lowest value.

9. Since the light ray is heading towards the center of the semi-circle, it is traveling along the normal as the normal is parallel to the radius of the circle (properties of circles). As the light is traveling along the normal, it does not bend at all when entering the glass block. As the light ray exits the glass block, it bends away from the normal since it is exiting a denser medium.

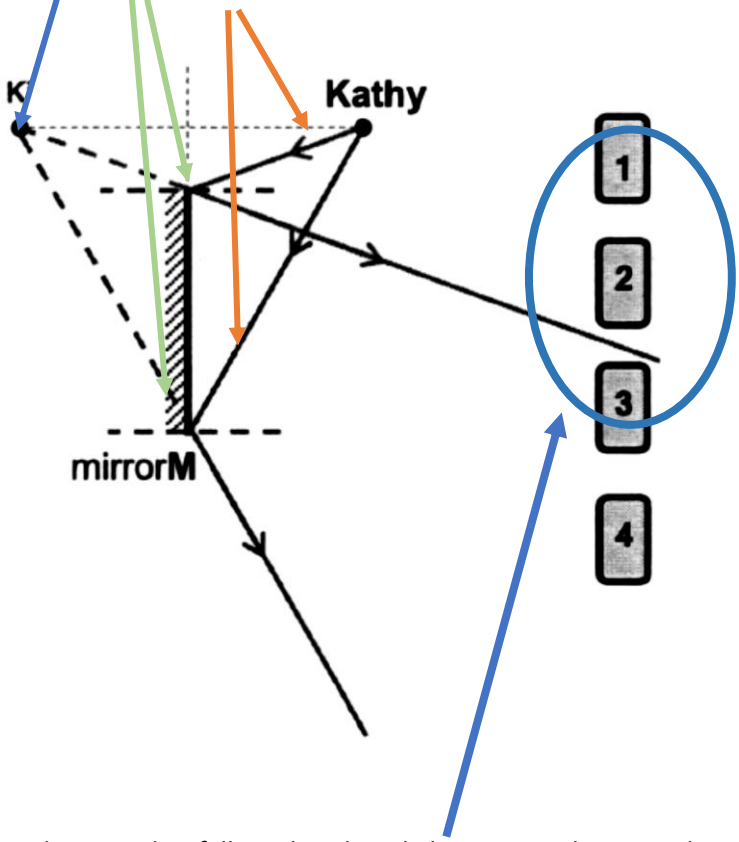


10. B.

The first step is to trace kathy's image in the mirror.

Then trace light rays from kathy's image to the top and bottom part of the mirror. Extend it all the way towards seats.

Connect with light rays to Kathy and you will get the following diagram:



From here, whatever that falls within the 2 light rays are the seats that can see Kathy in the mirror as it means the light rays bounced off from the mirror will be able to reach the seats.

How did you score?

If you scored between 50-70%, it means you have will be learning or have learned quite a lot from this simple exercise. Good for you. You have progressed in chemistry with greater knowledge of the chemical reactions. But there is much more for you to do. I recommend that you request more worksheets from your teacher and start exploring more questions.

If you scored between 70-90%, it means you are doing well in chemistry and you just need to find more challenging questions. Keep grinding and you will work your way to an A grading. Be sure to work more on your paper 2 questions such as those that require you to answer with the right keywords as well as the data-based ones.

If you scored a 100%, then good for you. You have good mastery of the fundamentals. Be sure of to work more on your paper 2 questions such as those that require you to answer with the right keywords as well as the data-based ones.

Keep working and have fun while learning! We have more questions like these every week during our lessons.