

I. E. A.

IEA/4 A  
IEA/4 B

BOOKLET 4

SCIENCE

This test contains questions dealing with different branches of Science. Some you will know about from your school work, some from your general knowledge and others you will be able to answer by using commonsense. Others you may not be able to do. Do not waste time over questions you cannot do; leave them and go on to the next question. You can come back to questions you have missed later, if you have time. You may answer even if you are not quite sure, but do not guess blindly.

Each of the questions or unfinished statements in this test is followed by five suggested answers, lettered A,B,C,D, and E. You have to decide which one answer you think best and then on your answer card make a solid pencil mark in the oval containing the correct answer letter.

Here is an example of how to fill in the answer on your answer card. Remember that the examples given on this page are to be answered in the section marked L on your answer card.

1. How long does the earth take to travel once around the sun?

- A. A day.
- B. A week.
- C. A month.
- D. A year.
- E. None of the above.

Since the earth travels round the sun in a year, the answer space D should be marked. This has been done on the answer card for the question 1 in the example section L.

Now try these three questions for practice. Fill in the space of your chosen answer on the answer card in section L.

2. Water would be turned into ice by

- A. heating it.
- B. stirring it quickly.
- C. putting salt in it.
- D. pouring it into a shallow dish.
- E. cooling it.

3. Which day of the year in the southern hemisphere has the longest period of daylight?

- A. 21st January.
- B. 21st March.
- C. 22nd December.
- D. 23rd September.
- E. 22nd June.

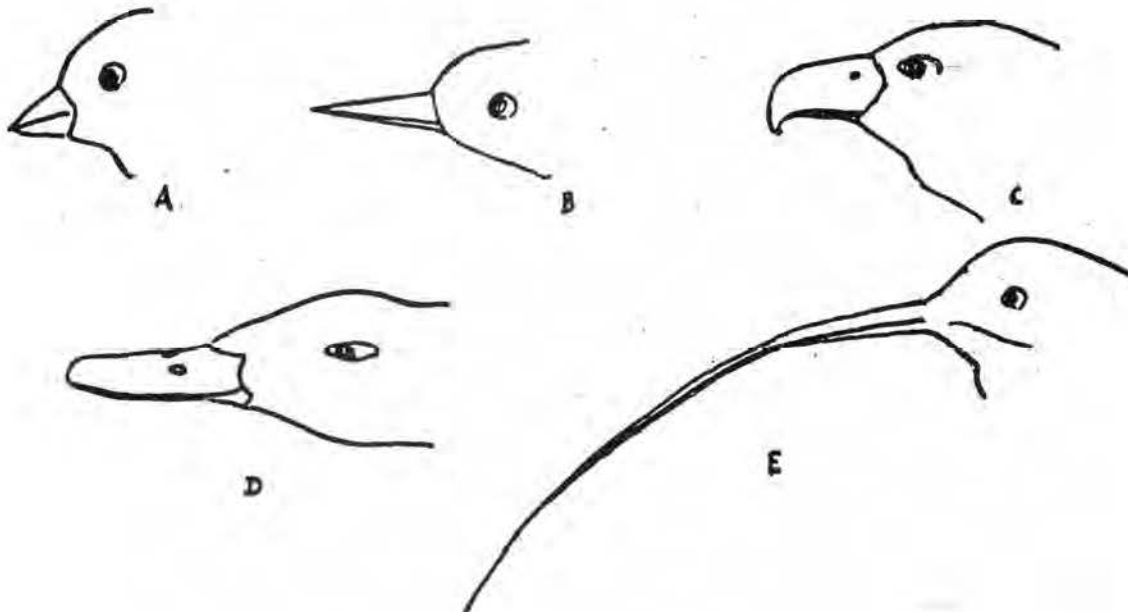
Sometimes you may be asked to pick out the one wrong answer or the one that does not fit in with the others.

4. Which of the following does NOT belong to the same group as the others?

- A. Eagle.
- B. Lion.
- C. Mouse.
- D. Elephant.
- E. Deer.

DO NOT TURN OVER UNTIL YOU ARE TOLD TO DO SO.

1. About how long would it take a rocket ship to reach the moon?
  - A. Two hours.
  - B. Several hours.
  - C. A few days.
  - D. A light-year.
  - E. Several years.
  
2. Which of the following statements is true about seeds?
  - A. All plants produce seeds.
  - B. All fruits contain a large number of seeds.
  - C. All seeds are good to eat.
  - D. Every seed contains a young plant, stored food and a seed coat.
  - E. The food stored in seeds is always in the cotyledon.
  
3. Which of these substances is found in every living cell?
  - A. Protein.
  - B. Chlorophyll.
  - C. Cellulose.
  - D. Starch.
  - E. Haemoglobin.
  
4. While Joe was sitting under a tree, he watched a bird getting insects from between the cracks of the bark. Which drawing shows the kind of beak this bird had?



5. One of the following lists of small invertebrate animals contains only insects. Which one is it?
- A. Houseflies, Spiders, Mosquitoes, Woodlice.
  - B. Millipedes, Butterflies, Houseflies, Mosquitoes.
  - C. Butterflies, Ants, Cockroaches, Houseflies.
  - D. Cockroaches, Butterflies, Spiders, Mosquitoes.
  - E. Ants, Moths, Beetles, Centipedes.
6. Which of the following organs is NOT situated in the abdomen?
- A. Liver.
  - B. Kidney.
  - C. Stomach.
  - D. Bladder.
  - E. Heart.
7. The serving of reheated meat in restaurants is often discouraged and sometimes prohibited by law. Which of the following is the main reason for this?
- A. Most people do not like it.
  - B. Valuable mineral salts are lost on reheating.
  - C. It is uneconomic to heat food twice.
  - D. Bacteria will multiply quickly on the warmed up meat.
  - E. Reheating causes a reduction in protein content.
8. Tissue from a cow is shown on analysis to contain protein, a small amount of fat, some iron, and large quantities of vitamins A and D. Which part of the body did it come from?
- A. Muscles.
  - B. Kidney.
  - C. Liver.
  - D. Heart.
  - E. Brain.
9. Which of the following experimental procedures would serve best to determine the effectiveness of inoculating children against measles?
- A. Take 50 children who have never had measles and expose them to the disease and then inoculate all of them.
  - B. Inoculate 25 of 50 children who have never had measles and then expose all 50 of them to the disease.
  - C. Inoculate 50 children who have not had measles and then expose all of them to the disease.
  - D. Take a random sample of 50 children, inoculate 25 of them and then expose all 50 of them to the disease.
  - E. Take a random sample of 50 children, inoculate all of them and then expose 25 of them to the disease.

10. Why is it that your body temperature does not fall even though you lose heat continually?
- The blood distributes heat round the body.
  - Respiration results in the liberation of heat.
  - Heat is constantly being absorbed from the sun.
  - Hot meals are eaten regularly.
  - Warm clothes are good insulators.

11. John put some seeds on moist cotton wool in a dish. Jane put some seeds of the same kind into a glass full of water by the side of his. After two days John's seeds sprouted but nothing seemed to happen to Jane's. Which of the following is the most probable explanation?
- Jane's seeds had been kept dry for too long.
  - Jane did not allow her seeds enough air.
  - Jane did not put the glass in a warm enough place.
  - Jane should have used a different kind of seed.
  - Jane did not use any cotton wool.

12. When alcohol is burned in air, water is formed. Another product of the combustion is a gas which turns lime water cloudy. Consider the following three statements with regard to these two facts

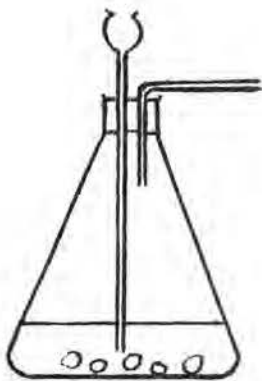
Statements.

- Carbon is a constituent element of alcohol.
- Hydrogen is a constituent element of alcohol.
- Oxygen is a constituent element of alcohol.

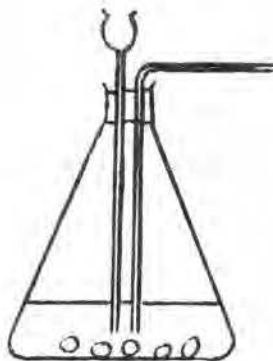
Which statement or combination of these statements can be deduced from the two facts given?

- I and II.
  - I, II and III.
  - I and III.
  - II and III.
  - I only.
13. When 2 g of zinc and 1 g of sulphur are heated together, practically no zinc or sulphur remains after the compound zinc sulphide is formed. What happens if 2 g zinc are heated with 2 g of sulphur?
- Zinc sulphide containing approximately twice as much sulphur is formed.
  - Approximately 1 g of sulphur will be left over.
  - Approximately 1 g of zinc will be left over.
  - Approximately 1 g of each will be left over.
  - No reaction will occur.

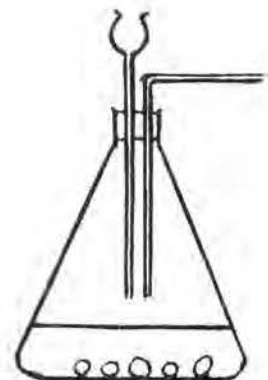
14. Heating a mixture of powdered iron and sulphur will result in the formation of
- a single element.
  - two other elements.
  - a solution.
  - an alloy.
  - a compound.
15. A clear solution of substance X is added to a clear solution of substance Y. No colour change is observed. Which of the following would provide evidence that in spite of no change in colour a chemical reaction had taken place?
- Any product is soluble in water.
  - The solutions of X and Y can be mixed in all proportions and still give the same result.
  - There is a rise of temperature when the two solutions are mixed.
  - The final liquid is shown to be neutral by using an indicator.
  - The experiment gives the same result when different concentrations of the two solutions are used.
16. Which of the following is the correct arrangement of apparatus for preparing a gas produced by the action of a liquid on a solid?



A



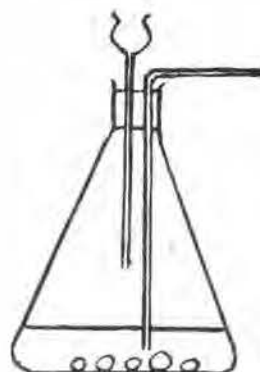
B



C



D



E

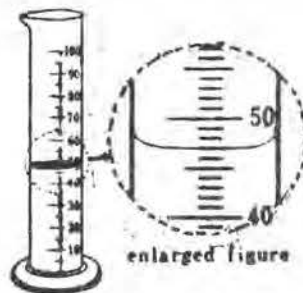
17. Which of the following methods would you employ in order to obtain copper from copper oxide? You may find that your knowledge of the activity series will help you.
- Heat copper oxide with silver.
  - Pass hydrogen through copper oxide suspended in cold water.
  - Pass hydrogen over hot copper oxide.
  - Heat copper oxide with dilute hydrochloric acid.
  - Pass steam over hot copper oxide.
18. We can explain chemical changes in terms of the gain or loss or sharing of
- electrons furthest from the nucleus of the atom.
  - electrons closest to the nucleus of the atom.
  - electrons from the nucleus of the atom.
  - protons from the nucleus of the atom.
  - neutrons from the nucleus of the atom.

Items 19 and 20 refer to the following table.

Substance	Electrical Conductivity	Melting Point	Boiling Point	Effect of Heating in Air
P	Good when solid or liquid	97°C	889°C	Burns to form a single oxide which forms an alkaline solution in water.
Q	Nonconductor	113°C	444°C	Burns to form a single oxide which forms an acidic solution in water.
R	Nonconductor	5°C	80°C	Burns to form carbon dioxide and water.
S	Nonconductor when solid, good conductor when molten	800°C	1413°C	Melts; no new substance formed.

19. Which substance could be a metallic element?
- Substance P.
  - Substance Q.
  - Substance R.
  - Substance S.
  - None of these.
20. Which substance would not change in weight when heated in air?
- Substance P.
  - Substance Q.
  - Substance R.
  - Substance S.
  - None of these.

21. Mary and Jane each bought the same kind of rubber ball. Mary said, "My ball bounces better than yours." Jane replied, "I'd like to see you prove that." What should Mary do?
- Drop both balls from the same height and notice which bounces higher.
  - Throw both balls against a wall and see how far each ball bounces off the wall.
  - Drop the two balls from different heights and notice which bounces higher.
  - Throw the balls down against the floor and see how high they bounce.
  - Feel the balls by hand to find which is the harder.
22. The measuring cylinder contains a certain volume of water. The enlarged figure shows a view of the surface of the water as seen from the side. What is the volume of the water?

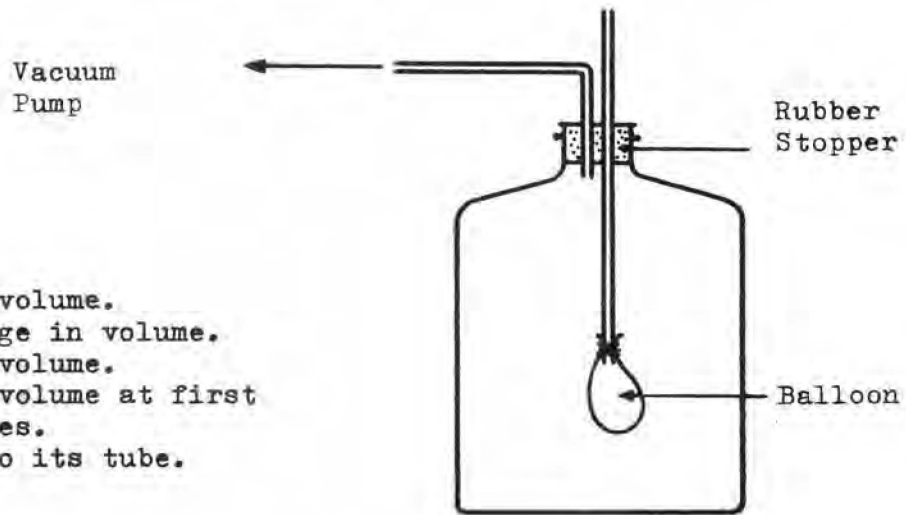


- $50 \text{ cm}^3$
  - $49 \text{ cm}^3$
  - $48 \text{ cm}^3$
  - $47 \text{ cm}^3$
  - $46 \text{ cm}^3$
23. It is said that, dressed in the same way, a man would be able to jump higher on the Moon than on the Earth. Which of the following is the best explanation of this?
- His mass is less when he is on the Moon.
  - The force of gravity is less on the Moon than on the Earth.
  - His distance from the Earth is greater when he is on the Moon.
  - There is no air on the Moon to offer resistance.
  - Newton's Laws of Motion do not apply on the Moon.

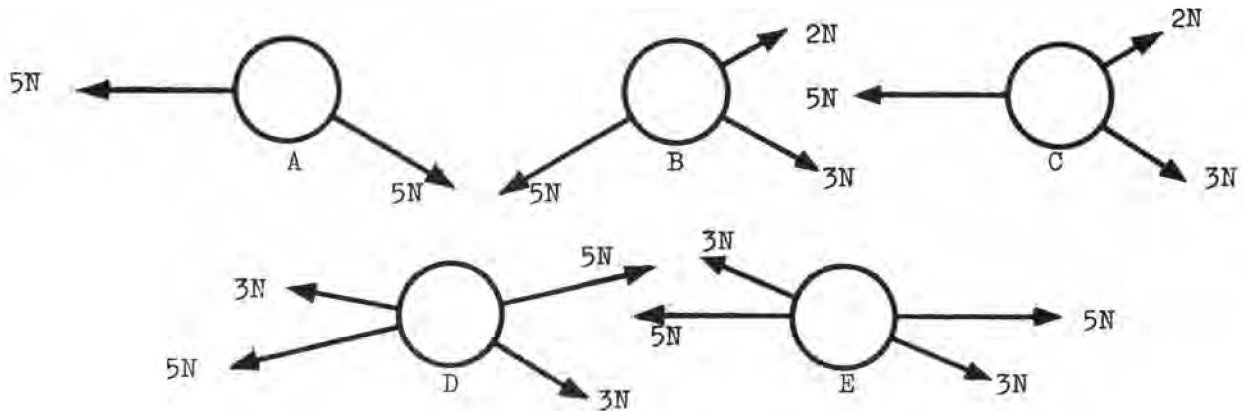


24. What happens to the balloon when the air in the bottle is extracted by a vacuum pump?

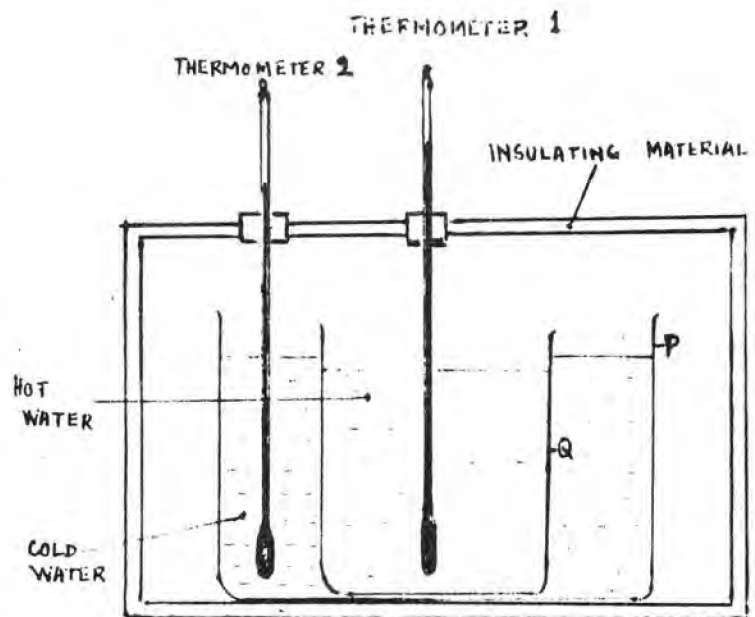
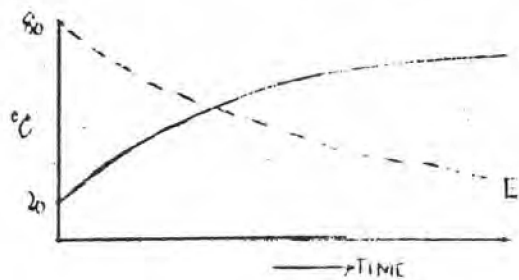
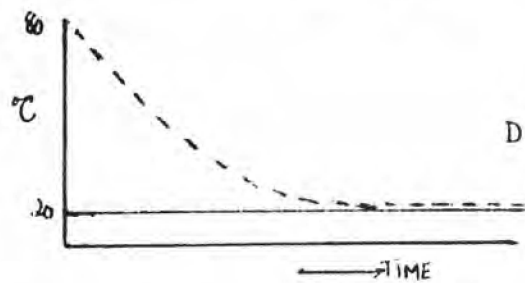
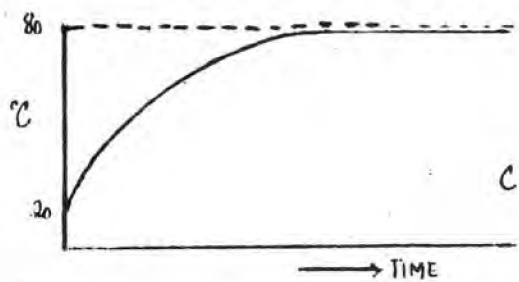
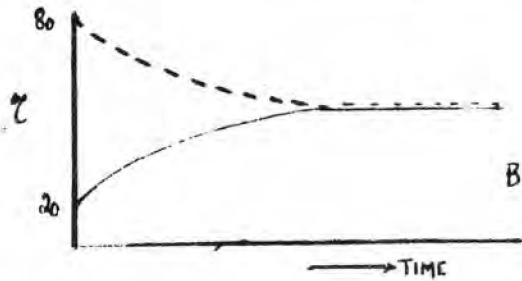
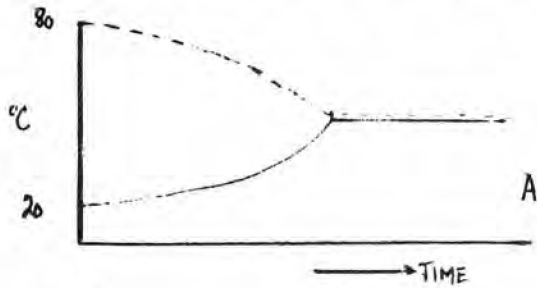
- A. It increases in volume.  
 B. It does not change in volume.  
 C. It decreases in volume.  
 D. It decreases in volume at first but then increases.  
 E. It is sucked into its tube.



25. The diagrams show rings being pulled by different forces in the same plane. Which ring is in equilibrium under the action of the given forces?



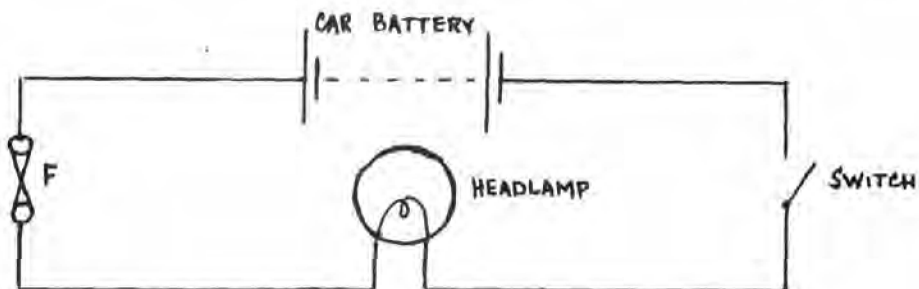
26. Using the apparatus shown in the figure below, 100g of water at 20°C was poured into the outer container P and its temperature read at intervals from thermometer 2. At the same time 100g of water at 80°C was poured into the inner container Q and its temperature read at intervals from thermometer 1. Which of the following graphs best represents the changes in the temperatures of the water in the two containers.



----- THERMOMETER 1

————— THERMOMETER 2

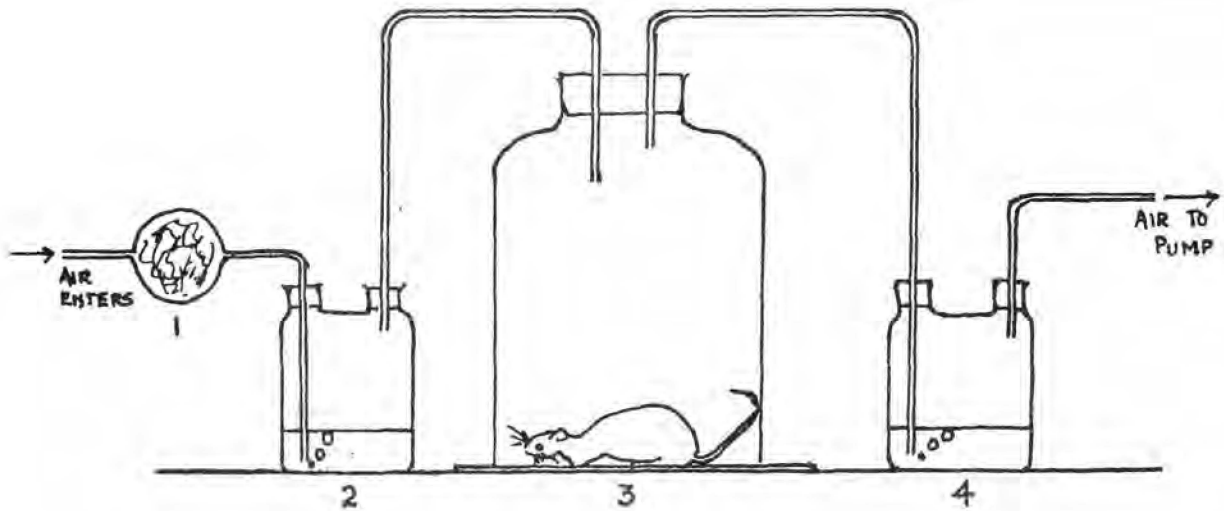
27. Under which of the following conditions does water evaporate fastest?
- On a hot and dry day.
  - On a hot and moist day.
  - On a cold and dry day.
  - On a cold and moist day.
  - On a calm and moist day.
28. The crews of two ships at sea can communicate with each other by shouting through loudhailers. It is impossible for the crews of spaceships a similar distance apart in space to do this because
- the temperature is too low.
  - the sound is reflected.
  - the pressure is too high inside the space ship.
  - the sound barrier has been broken.
  - there is no air.
29. Jane was trying to find out which things she could pick up with a magnet. With which one of the following would she NOT succeed?
- A magnetic compass needle.
  - A steel screw.
  - An iron nail.
  - A sewing needle.
  - A brass paper fastener.
30. The following diagram shows a lighting circuit in a car.



Fuse F would most probably be made of

- thin wire with low melting point.
- thick wire with low melting point.
- thick wire with high melting point.
- thin wire with high melting point.
- the same wire as the connecting leads.

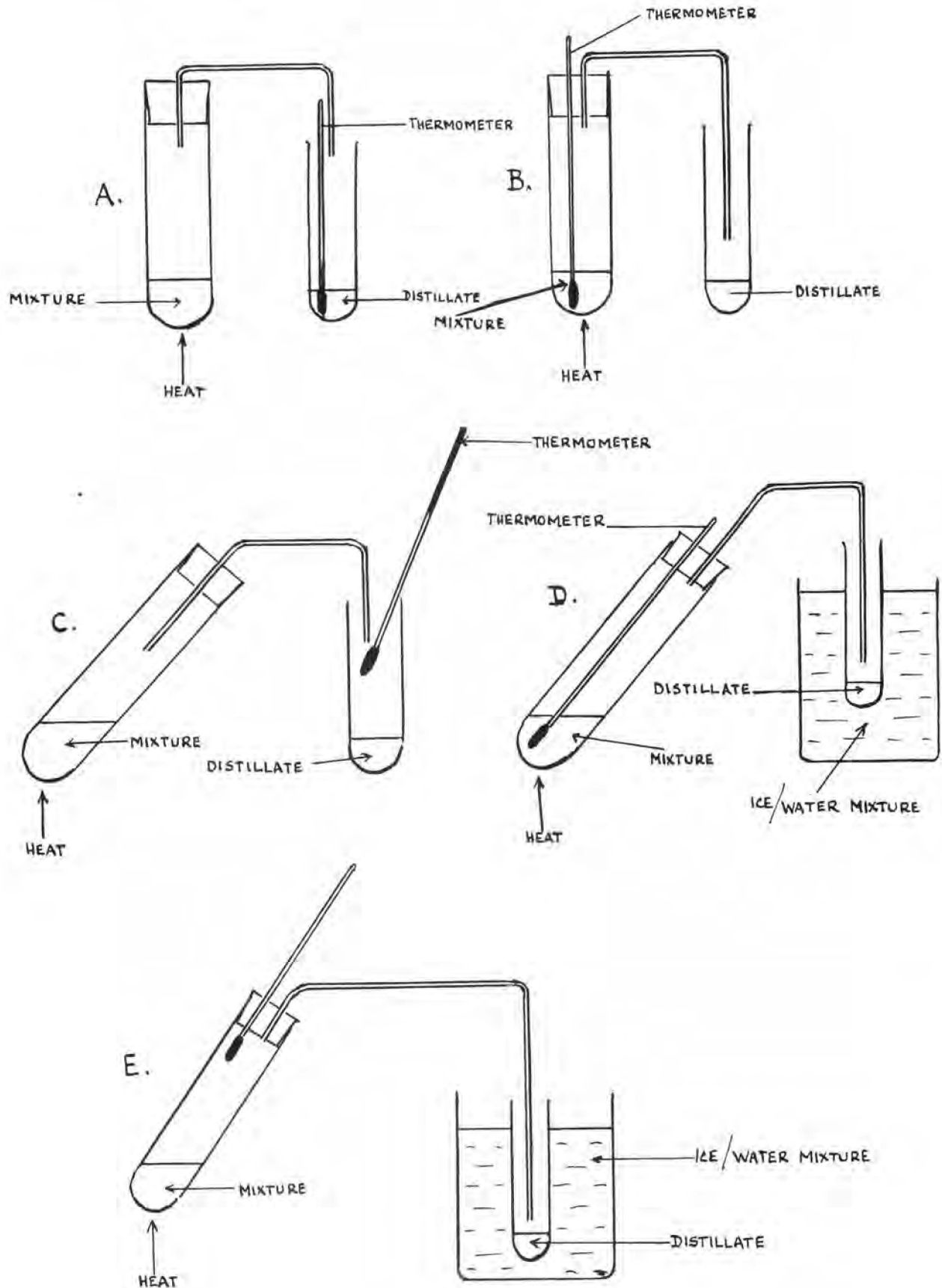
Questions 31 and 32 refer to the following diagram which shows an arrangement of apparatus which can be used to show that an animal gives out carbon dioxide in respiration.



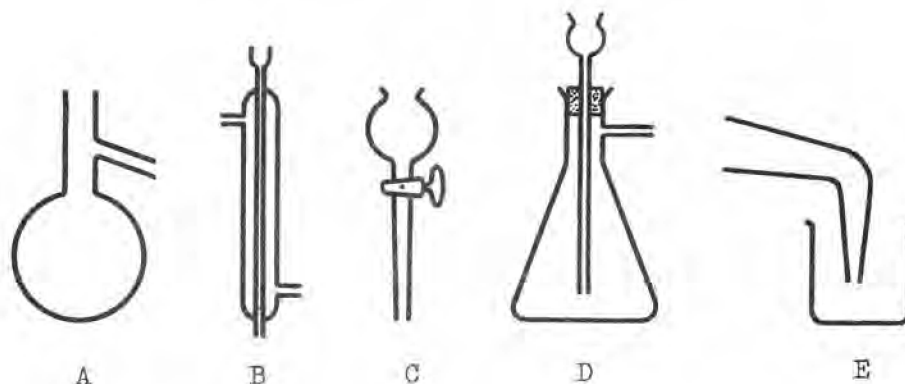
1 contains a substance which removes carbon dioxide from air, 2 and 4 both contain a liquid which changes in appearance when carbon dioxide passes through it.

31. Of the following kinds of containers for the animal which one would give the quickest result?
- A small container.
  - A large container.
  - A container in bright light.
  - A container covered with a dark cloth.
  - A container in which the air is kept moist by means of wet cotton wool.
32. If air leaked into chamber 3, which one of the following effects would be seen?
- The liquid in 4 would change more rapidly.
  - The rate of bubbling in 2 would slow down or stop.
  - The rate of bubbling in 4 would slow down or stop.
  - Liquid would pass from 4 into 3.
  - The liquid in 2 would change more rapidly.

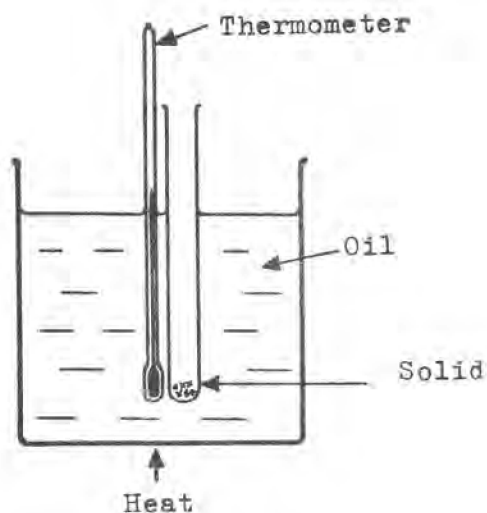
33. A small sample of a mixture of liquids with different boiling points is to be separated into its components by distillation. Which of the following sets of apparatus is most suitable for carrying this out and for determining the temperature at which each of the components of the mixture boiled?



34. Which of the following pieces of glassware is mainly for condensing gases to liquids?



35.



In order to decide whether a substance is pure the apparatus illustrated above is used to find its melting point. The melting point of the pure substance is known. Which one of the following is the most important in choosing the oil to use?

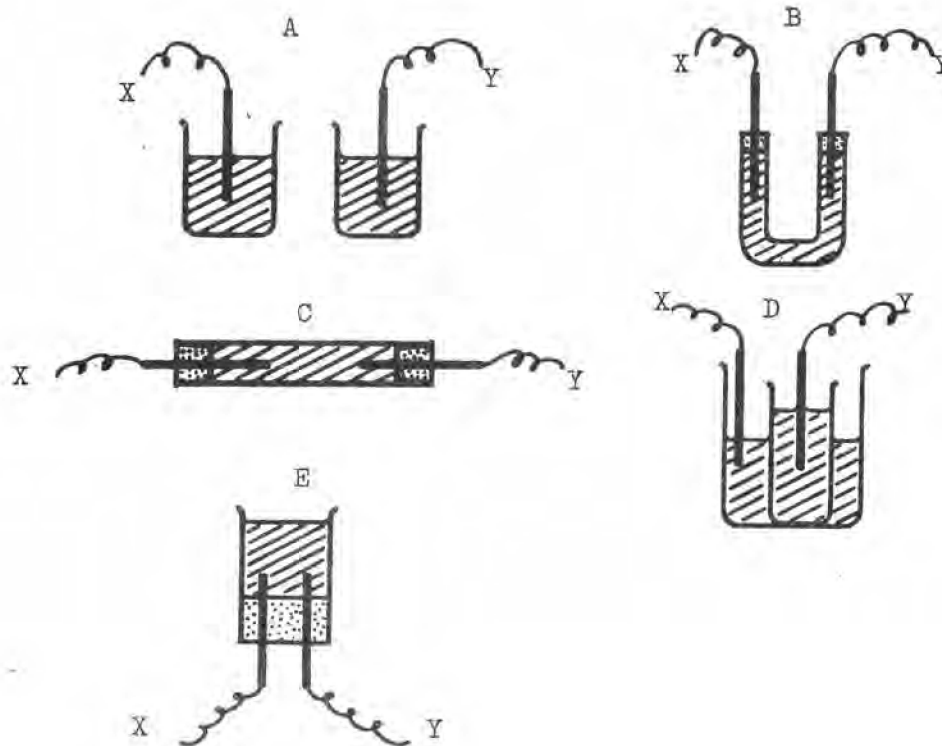
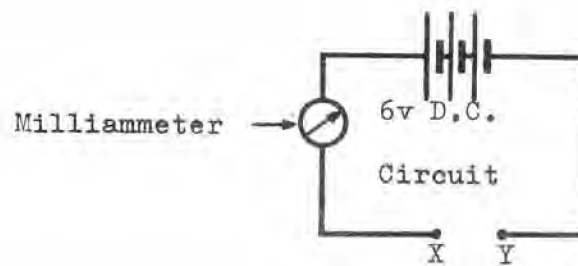
- The oil should be colourless.
- The oil should boil at the same temperature as the melting point of the pure solid.
- The oil should boil at least ten degrees higher than the melting point of the solid.
- The oil should boil at a temperature at least ten degrees lower than the melting point of the solid.
- The oil should have a high density.

36. It is unwise to condense the vapour of a liquid with a boiling point of  $240^{\circ}\text{C}$  in a glass water-cooled condenser because
- A. the vapour might react with the water,
  - B. the vapour will not be condensed,
  - C. the condenser will probably crack,
  - D. the water will boil,
  - E. solid will form and block the condenser.

37. A number of different solutions have to be tested to find out whether or not they will each conduct electricity and, if so, what products are liberated.

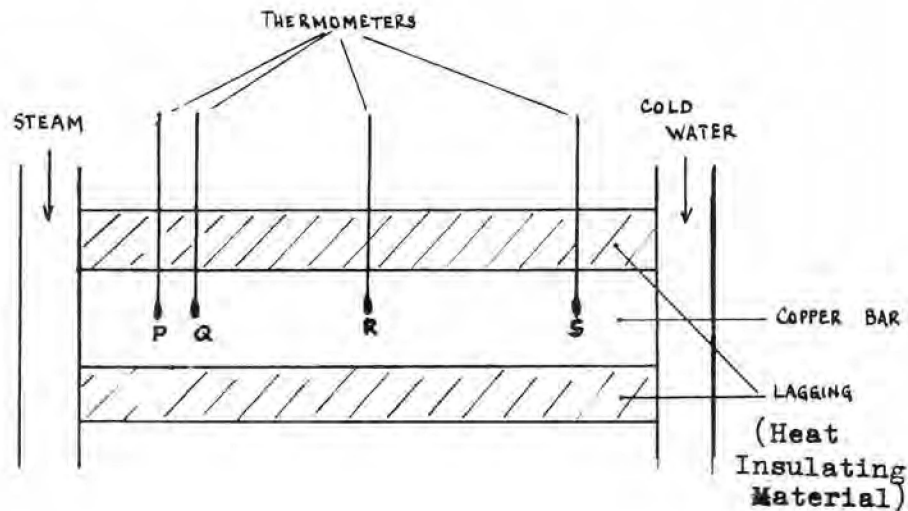
Using the circuit shown below, which of following pieces of apparatus would be most suitable when connected between points X and Y?

(All the beakers and tubes are made of glass, the electrodes of carbon, and solutions are shown shaded.)





38. One end of a well-insulated copper bar is heated and the other kept cold, as shown in the figure. The temperature at different points on the bar can be read by thermometers dipping into small holes at P, Q, R and S. The distance between P and Q is 1.0 cm. and the drawing is to scale.

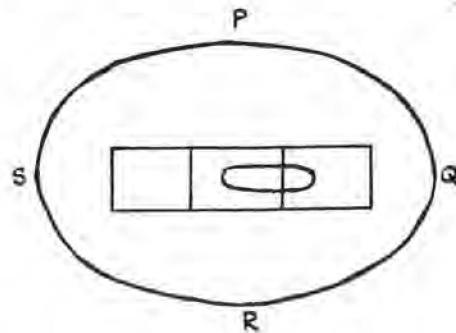


The temperature falls uniformly along the bar, and it is required to find the temperature gradient, or fall in temperature for unit length.

The two thermometers to be read for this purpose should be those placed at

- A. P and Q
  - B. P and R
  - C. P and S
  - D. Q and S
  - E. R and S
39. A spirit level is placed on the top of a table and viewed from above when it appears as shown in the diagram. Which of the points P, Q, R and S should be raised as a first step towards making the table level?

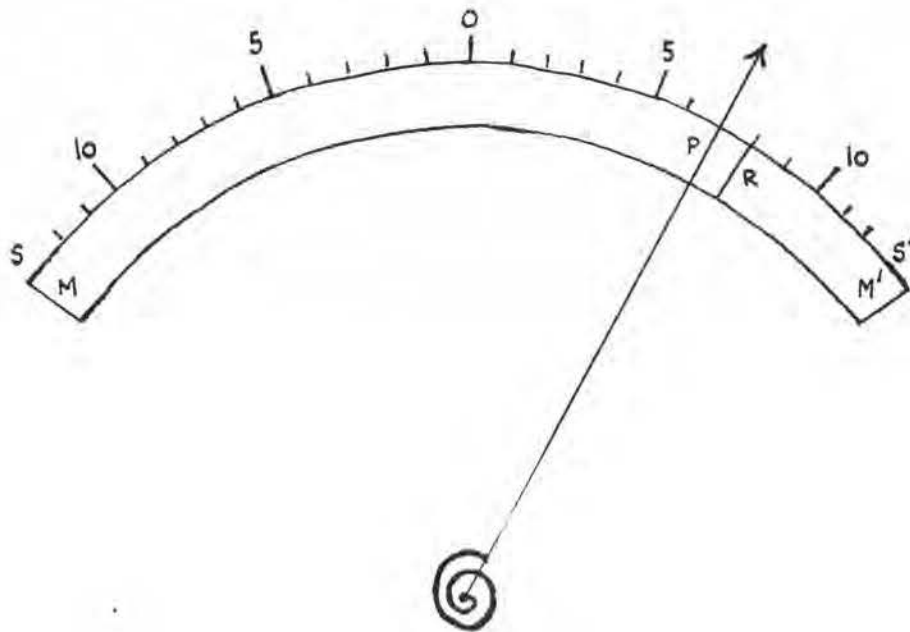
- A. P
- B. Q
- C. R
- D. S
- E. Any one of the above



40. A meter has a pointer P which moves over a strip mirror MM' and a scale SS'. When photographed at an angle, the meter appears as shown, where R is the reflection of the pointer in the mirror.

What is the correct meter reading?

- A. Between 6 and 7 units.
- B. 7 units.
- C. Between 7 and 8 units.
- D. 8 units.
- E. Between 8 and 9 units.



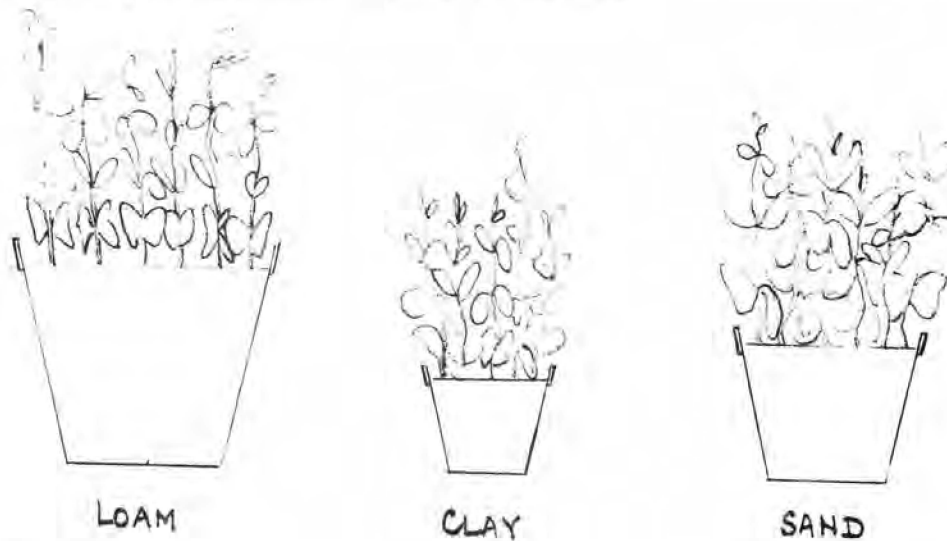
END OF SECTION A

DO NOT TURN OVER UNTIL YOU ARE TOLD TO DO SO

## SECTION B

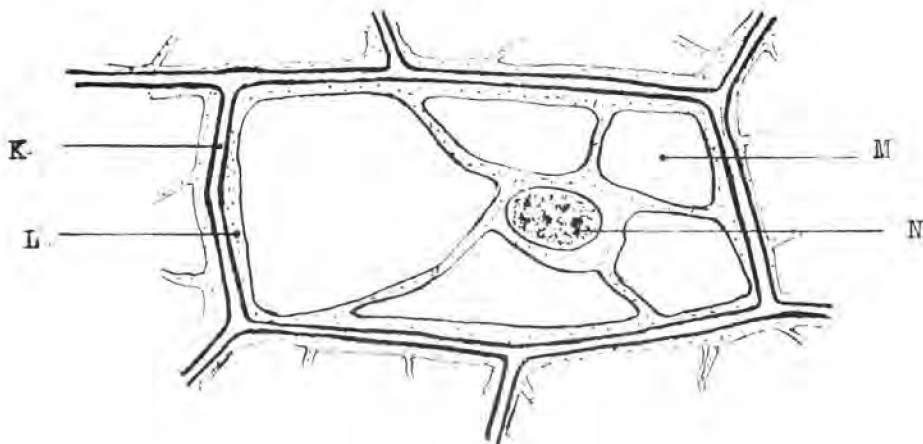
1. The sun is the only body in our solar system that gives off large amounts of light and heat. We see the moon because it is
  - A. reflecting light from the sun.
  - B. without an atmosphere.
  - C. a star.
  - D. the biggest object in the solar system.
  - E. nearer the earth than the sun.
  
2. In an experiment green leaves were put in a jar and the apparatus was kept in the dark. Lime water was turned cloudy by the gas that formed in the jar. Which of the following gives the best explanation of this result?
  - A.  $O_2$  was produced by photosynthesis.
  - B.  $O_2$  was produced by respiration.
  - C.  $CO_2$  was produced by respiration.
  - D.  $O_2$  was used up in respiration.
  - E.  $CO_2$  was produced by photosynthesis.
  
3. John brought the skull of an animal to school. His teacher said she did not know what the animal was but she was sure that it was one that preyed on other animals for its food. Which clue, do you think, led her to this conclusion?
  - A. The eye sockets faced sideways.
  - B. The skull was much longer than it was wide.
  - C. There was a projecting ridge along the top of the skull.
  - D. Four of the teeth were long and pointed.
  - E. The jaws could work sideways as well as up and down.

4. Tom wanted to learn which of three types of soil- clay, sand or loam- would be best for growing beans. He found three flowerpots, put a different type of soil in each pot, and planted the same number of beans in each, as shown in the drawing. He placed them side by side on the window sill and gave each pot the same amount of water.



Why was Tom's experiment NOT a good one for his purpose?

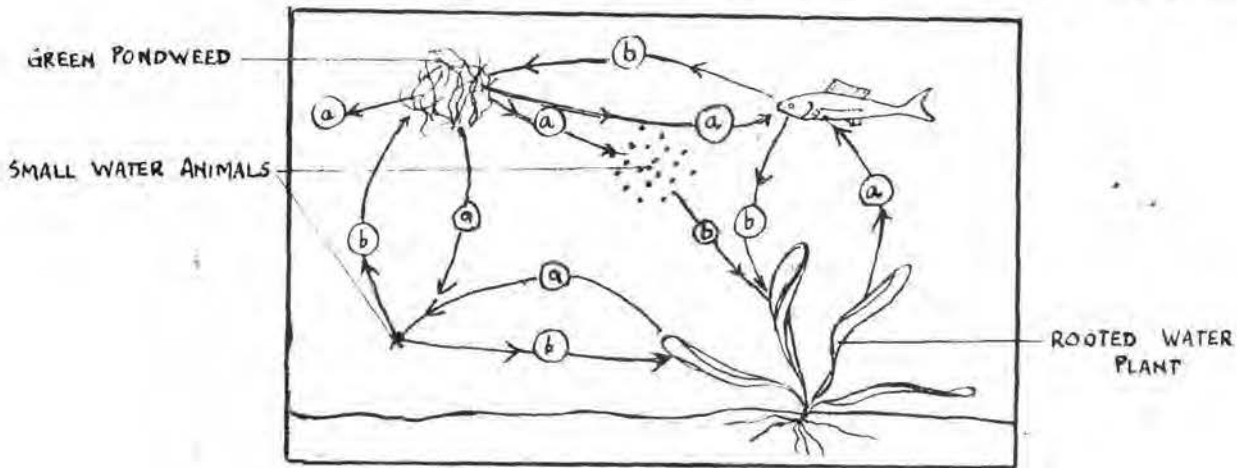
- A. The plants in one pot got more sunlight than the plants in the other pots.
  - B. The amount of soil in each pot was not the same.
  - C. One pot should have been placed in the dark.
  - D. Tom should have used different amounts of water.
  - E. The plants would get too hot on the window sill.
5. The drawing represents a plant cell. In which of the four regions marked might chloroplasts be found?



- A. In K only
- B. In L only
- C. In M only
- D. In N only
- E. In both K and L

6. The energy for photosynthesis is generally obtained from
- chlorophyll.
  - chloroplasts.
  - sunlight.
  - carbohydrates.
  - carbon dioxide.

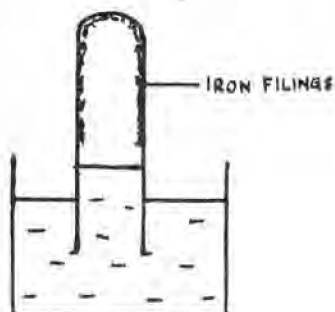
7. The diagram below shows an example of interdependence among aquatic organisms. During the day the organisms either use up or give off (a) or (b) as shown by the arrows. Choose the right answer for (a) and (b) from the alternatives given.



- a is oxygen and b is carbon dioxide.
  - a is oxygen and b is carbohydrate.
  - a is nitrogen and b is carbon dioxide.
  - a is carbon dioxide and b is oxygen.
  - a is carbon dioxide and b is carbohydrate.
8. What does an active muscle, that is, a muscle which is doing work, give up to the blood?
- Carbon dioxide.
  - Oxygen.
  - Nitrogen.
  - Vitamin B.
  - Glucose.
9. The Andes are high mountains in South America and their inhabitants live and work at high altitudes. These people have almost twice as many red corpuscles in their blood as do the people living in the valleys. Which one of the following is the best explanation of this?
- In the Andes there is less air pressure acting on the inhabitants' blood vessels and so new red corpuscles can be produced more quickly.
  - Because there is a smaller amount of oxygen in the air of the Andes the inhabitants breathe more deeply in order to increase the total amount of oxygen in their lungs.
  - In the Andes there is less oxygen entering the lungs of the inhabitants so that an increase in the number of red corpuscles enables a larger proportion of this oxygen to be absorbed.
  - Inhabitants of the Andes need more red corpuscles to transport oxygen through the blood vessels because there is less oxygen in the air they breathe.
  - The lower air pressure in the Andes causes blood to circulate more quickly through the blood vessels and so more red corpuscles are needed to transport the oxygen.

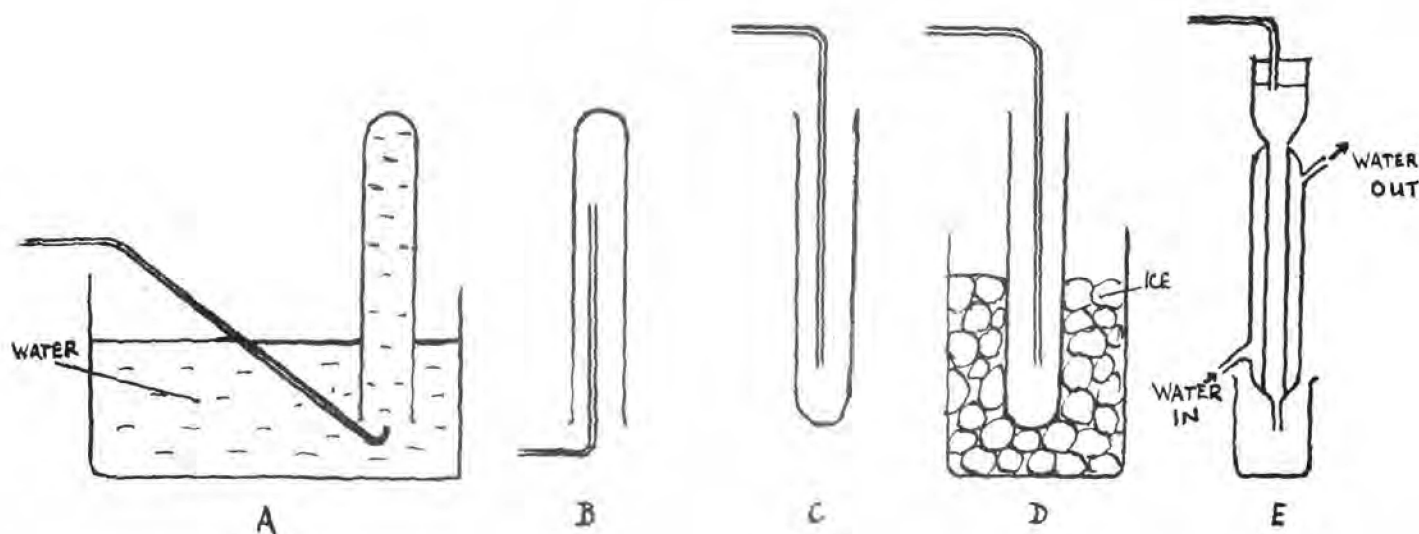
10. All of the following are aspects of the reproductive process. Which one of them must occur before we can be certain that fertilisation has taken place?
- A. A male organism must find a mate.
  - B. Reproductive organs must be produced.
  - C. The nucleus of a male gamete must fuse with that of a female gamete.
  - D. A spermatozoon must reach an egg cell.
  - E. A female gamete must provide a store of food for the embryo.
11. Paint applied to an iron surface prevents the iron from rusting by
- A. preventing nitrogen from coming in contact with the iron.
  - B. reacting chemically with the iron.
  - C. preventing carbon dioxide from coming in contact with the iron.
  - D. making the surface of the iron smoother
  - E. preventing oxygen and moisture from coming in contact with the iron.
- 
12. Flour is a fine powder obtained by grinding wheat or other cereal grains. A pile of grain burns only very slowly whereas flour dust suspended in air is explosive. Which of the following is the best explanation of this?
- A. The heat produced when small particles burn is greater than the heat produced by the burning of large particles of the same substance.
  - B. Grinding the grain changes its chemical composition.
  - C. For the same quantity of the material, small particles have a greater surface area in contact with air than large particles.
  - D. Small particles possess more energy than large particles.
  - E. The flour burns completely whereas the pile of grain does not.
13. Two given elements combine to form a poisonous compound. Which of the following conclusions about the properties of these two elements can be drawn from this information?
- A. Both elements are certainly poisonous.
  - B. At least one element is certainly poisonous.
  - C. One element is poisonous, the other is not.
  - D. Neither element is poisonous.
  - E. Neither element need be poisonous.

14. A test tube coated with iron filings on the inside was clamped vertically in a beaker of water. Water gradually rose a short distance in the test tube as shown in the sketch.



- Of the following, the best explanation of this is that
- water condenses inside the tube.
  - the iron gives off a gas which dissolves in the water.
  - the rust which replaces the iron takes up less space than the iron.
  - the iron reacts with oxygen from the air inside the tube.
  - oxygen from inside the tube dissolves in the water.
15. The presence of ions in a given water solution is most directly detected by
- finding out if the solution conducts electricity.
  - measuring the density of the solution and comparing it with those of the pure solute and water.
  - finding out if the solution has an electric charge.
  - evaporating the solution and testing the residue for conductivity.
  - adding an ionic substance and seeing if there is a reaction.
16. Which one of the following elements forms an oxide which turns red litmus paper blue when added to water?
- Phosphorus.
  - Carbon.
  - Iron
  - Sulphur.
  - Calcium.
17. In which of the following cases will heat be generated?
- When sodium hydroxide dissolves in water.
  - When water is decomposed.
  - When ice thaws.
  - When water evaporates.
  - When concentrated sulphuric acid dissolves in water.
- 1 and 2.
  - 1 and 5.
  - 3 and 4.
  - 3, 4 and 5.
  - 2, 3, 4 and 5.

18. You find what appear to be salt (sodium chloride) deposits. In order to learn what the deposits are, which of the following items of information would be most valuable?
- Percentage of sodium chloride in the sample.
  - Percentage of magnesium chloride in the sample.
  - Specific gravity of the sample.
  - Chemical composition of the sample.
  - Solubility in water of the sample.
19. Which is the most suitable apparatus from those shown below for collecting pure oxygen gas by a student in a school laboratory?



20. Which one of the following substances does not consist mainly of carbon atoms?
- Diamond.
  - Graphite.
  - Seet.
  - Ruby.
  - Charcoal.
21. An iron container is evacuated and weighed. Then it is filled with hydrogen gas and weighed again.

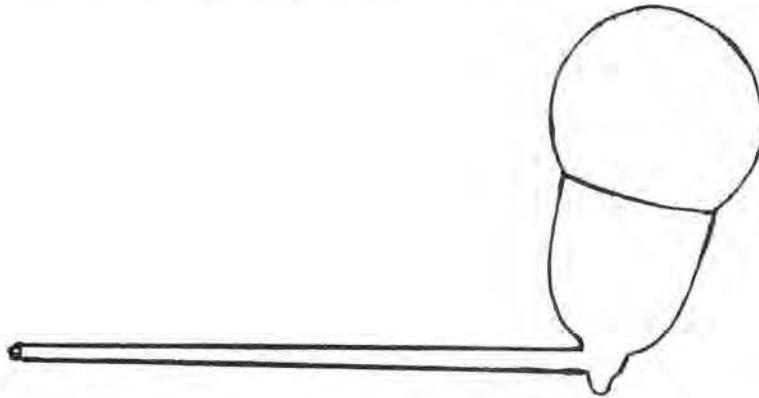


The weight of the container full of hydrogen compared to the weight of the evacuated container is

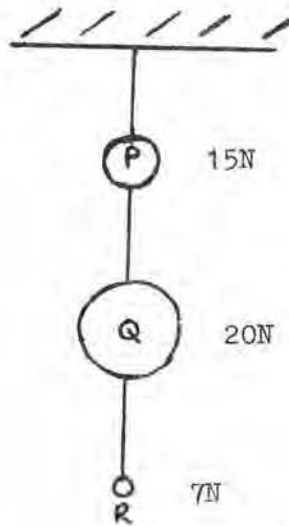
- less.
- greater.
- the same.
- greater or less depending on the volume of the gas in the container.
- greater or less depending on the temperature of the gas in the container.



22. Ann was playing with a bubble pipe. When the bubble was the size of the one in the picture, she took the pipe out of her mouth. What do you think happened to the bubble after that?



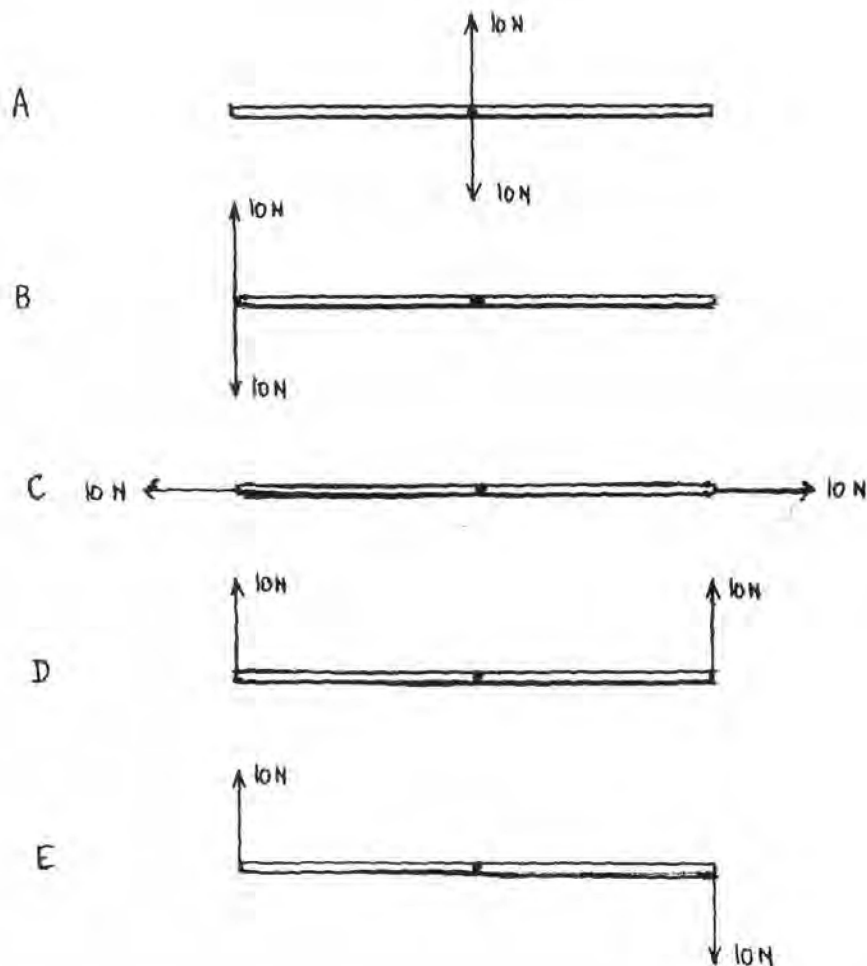
- A. It got larger for a time and then stayed at this size.  
 B. It got smaller for a time and then stayed at this size.  
 C. It got smaller and smaller and disappeared into the pipe.  
 D. It stayed on the pipe without getting larger or smaller.  
 E. It became larger and larger until it burst.
23. The objects P, Q and R of weight 15N, 20 N and 7 N, are hung with a light thread as shown in the figure.



What is the tension between P and Q?

- A. 42 N  
 B. 35 N  
 C. 27 N  
 D. 15 N  
 E. 7 N

24. A uniform rod, pivoted at its centre, is acted on by two forces in the same plane. In which case is there a turning effect?

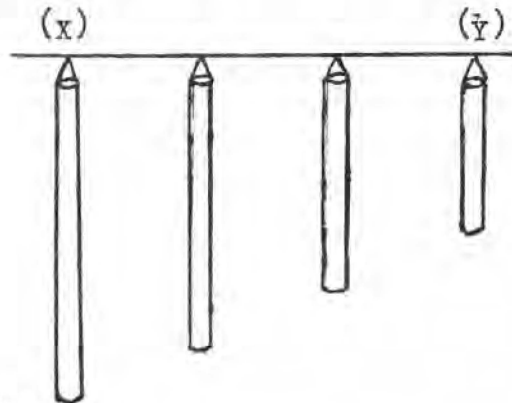


25. The advantage of using a lever such as that shown in the diagram to raise a weight  $W$  instead of lifting it directly is that

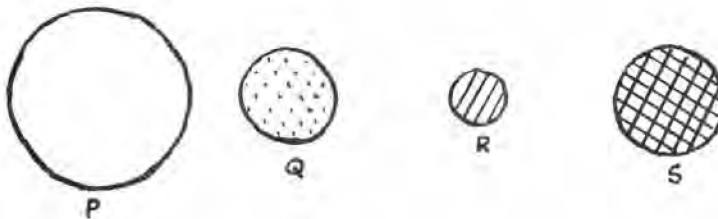


- A. less energy is required.  
 B. it is quicker.  
 C. less force is needed.  
 D. less movement is required.  
 E. less work has to be done.

26. Some boys made a set of chimes by cutting four pieces of pipe of different lengths from a long metal pipe and hanging them as shown in the picture below. Which of the pipes gave the lowest note when they struck it with a hammer?



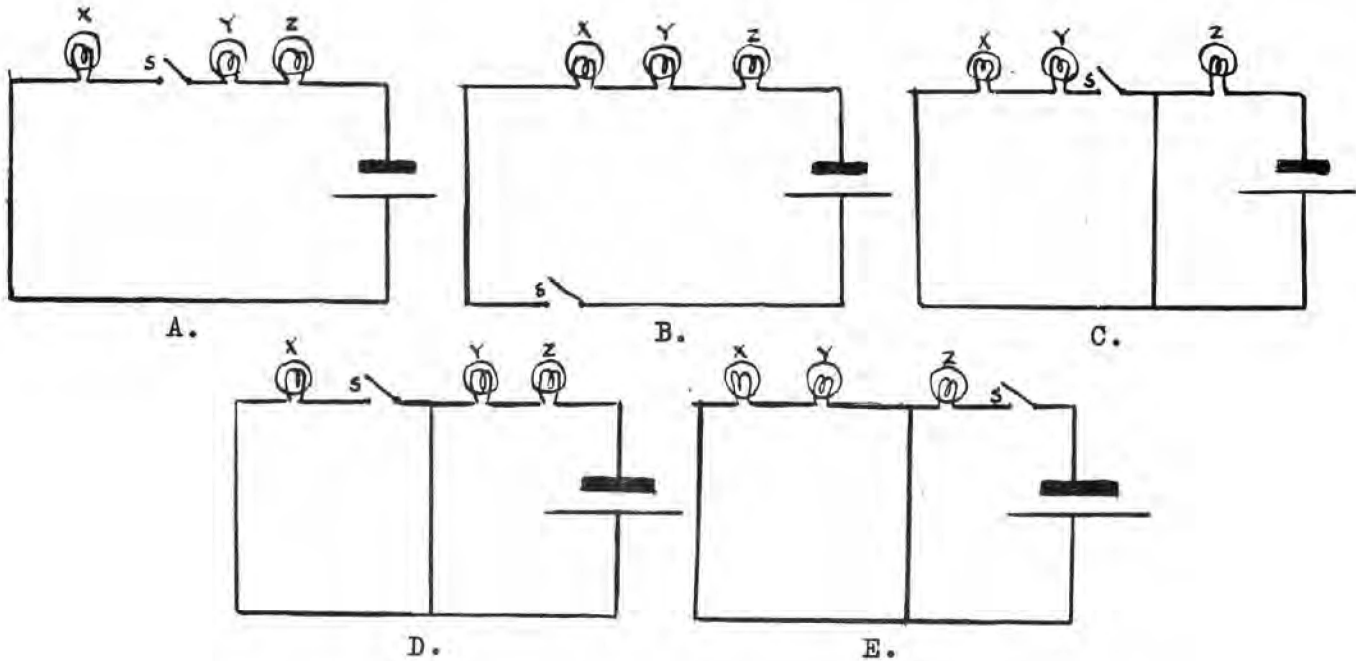
- A. Pipe (X).  
 B. Pipe (Y).  
 C. All gave the same note.  
 D. You cannot tell without trying.  
 E. It depends on where you hit it.
27. Four balls, P, Q, R and S shown to scale in the figures, are made of different materials, but have the same weight.



Which one of the following statements about their densities is true?

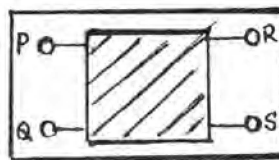
- A. They all have the same density.  
 B. You cannot know anything about their densities.  
 C. Which one has the highest density depends on how the volumes are measured.  
 D. P has the highest density.  
 E. R has the highest density.
28. A metal tray feels colder to touch than its plastic handle. This is because
- A. metal always has a lower temperature than plastic.  
 B. metal radiates much more heat than plastic and so cools more quickly.  
 C. metal conducts the heat away from your hand better than plastic.  
 D. plastic is a better heat conductor than metal.  
 E. a smooth surface allows a closer contact than a rough one.

29. X, Y and Z represent three lamps in a circuit, which also includes a battery and a switch S. When the switch is open X fails to light while Y and Z do. Which one of the following circuits is it?

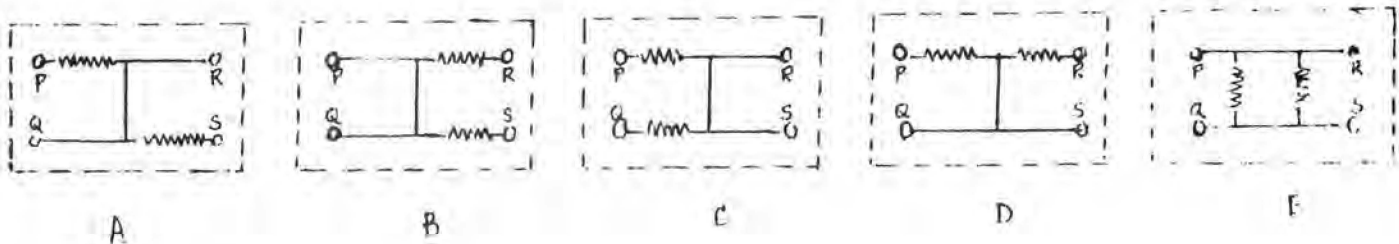


30. The figure shows a box with four terminals, P, Q, R and S. The following observations were made.

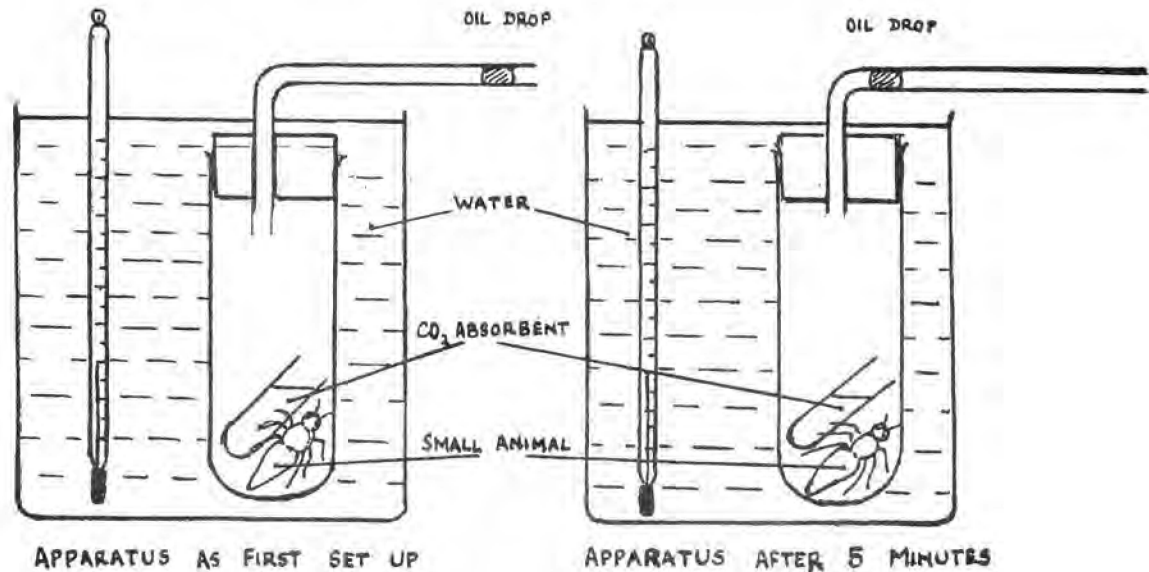
1. There is a certain amount of resistance between P and Q.
2. Resistance between P and R is twice that between P and Q.
3. There is not any appreciable resistance between Q and S.



Which of the following circuits is most likely to be within the box, assuming the resistances shown to be equal?



Questions 31, 32, 33 and 34 refer to the following diagram:

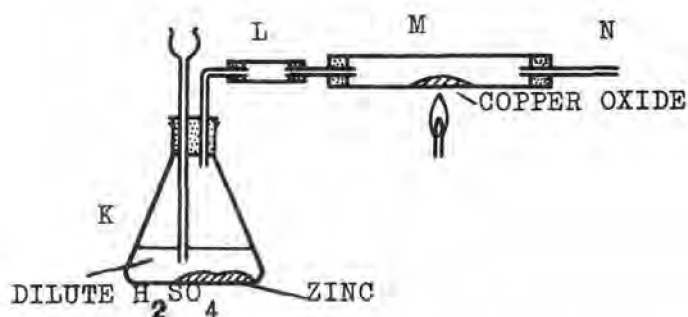


Animals take in oxygen and give out carbon-dioxide. Ordinary air contains very little carbon-dioxide.

31. Which of the following is measured with this apparatus?
- The rate of movement of the animal.
  - The amount of heat produced by the animal.
  - The rate of respiration of the animal.
  - The effect of carbon dioxide on the animal.
  - The amount of carbon-dioxide absorbed by the animal.
32. Why are a water bath and thermometer used?
- To keep the animal cool.
  - To keep the animal warm.
  - To keep the temperature from changing.
  - To prevent leakage of gases from the apparatus.
  - To keep the pressure constant around the animal.
33. Which one of the following is true after 5 minutes?
- The volume of air enclosed in the apparatus has increased.
  - The volume of air enclosed in the apparatus has decreased.
  - No change has taken place.
  - No further movement of the oil drop can be expected.
  - The oil drop will now begin to move in the other direction.

34. By which one of the following methods could the apparatus be made more sensitive to small changes of volume?
- By using a smaller test tube.
  - By raising the temperature of the water.
  - By using more of the carbon dioxide absorbent.
  - By using a wider tube for the oil drop.
  - By using a narrower tube for the oil drop.

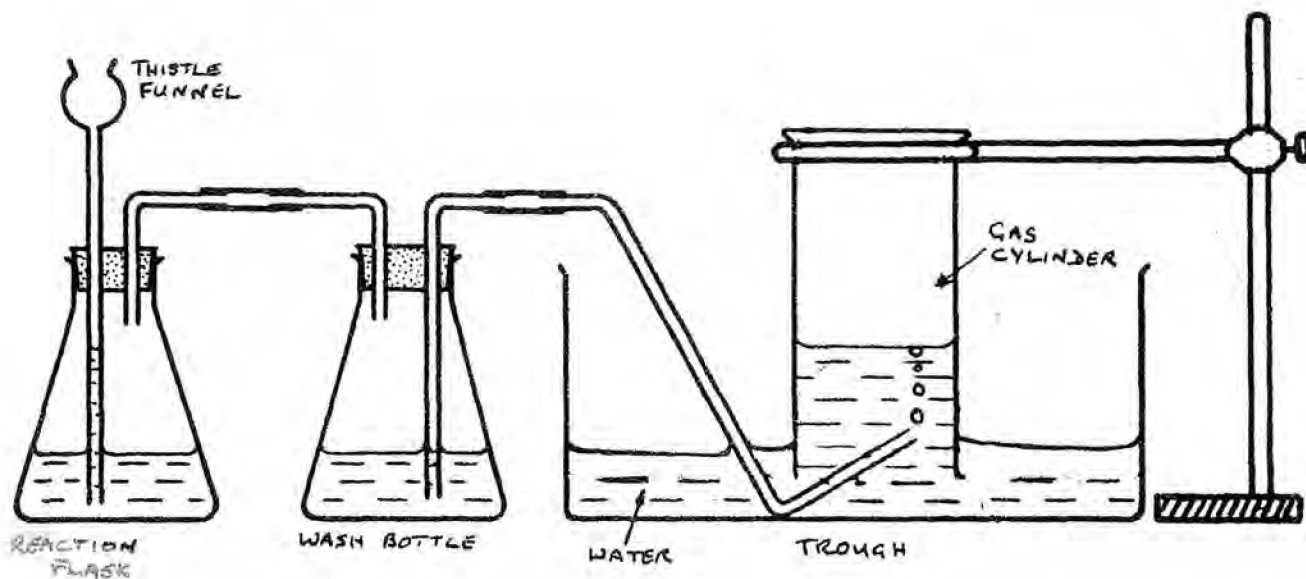
35. The apparatus shown below is assembled to reduce copper (II) oxide with hydrogen gas.



Hydrogen gas is produced in generator 'K' and is passed over hot copper (II) oxide in glass tube 'M'. Tiny droplets of water collect on the inside of tubes 'M' and 'N'. These droplets could possibly come from the generator 'K', being carried through into the rest of the apparatus by the stream of hydrogen. In order to test the truth of this explanation it would be best to

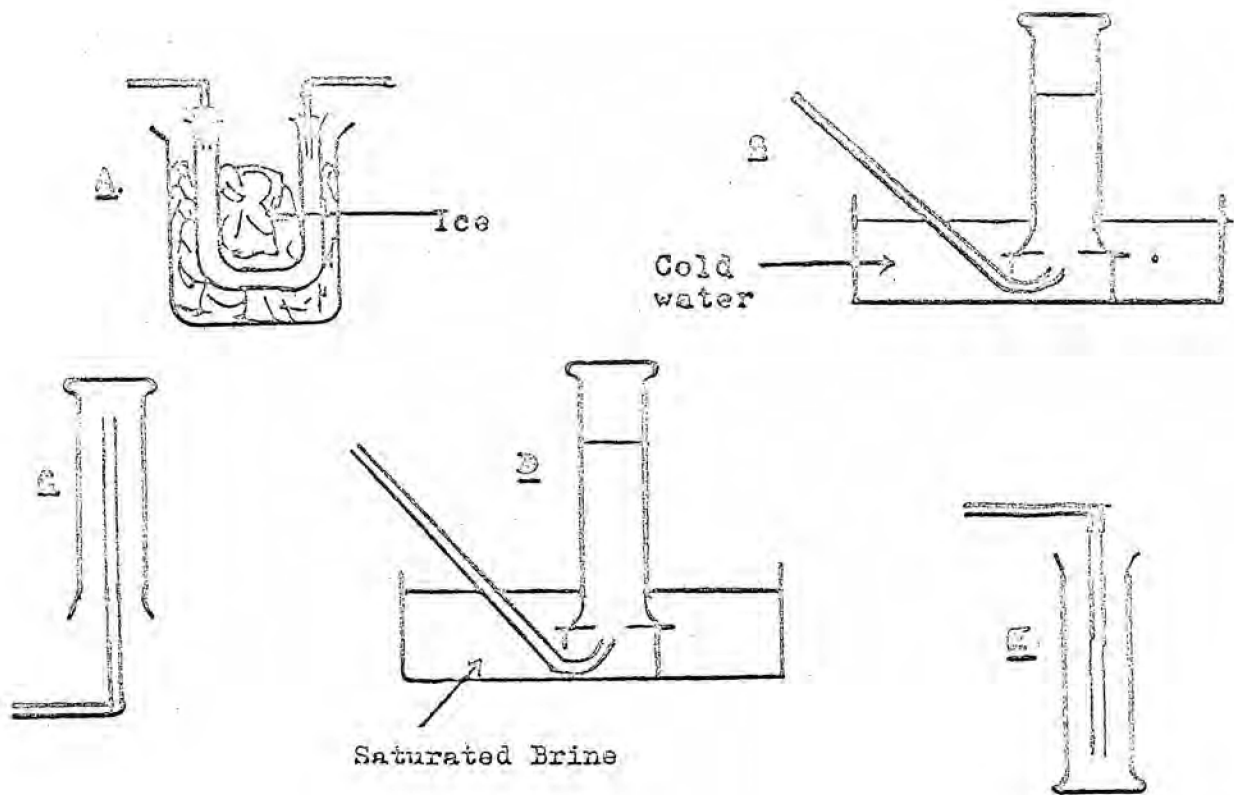
- heat tube 'M' further
- heat the generator 'K'
- add a calcium chloride drying tube at the right of tube 'M'
- add dry calcium chloride to tube 'L'
- try to produce hydrogen by the reaction of zinc with a different acid.

36.



Which one of the following correctly lists the errors in the apparatus diagram shown above for preparing a water-insoluble gas?

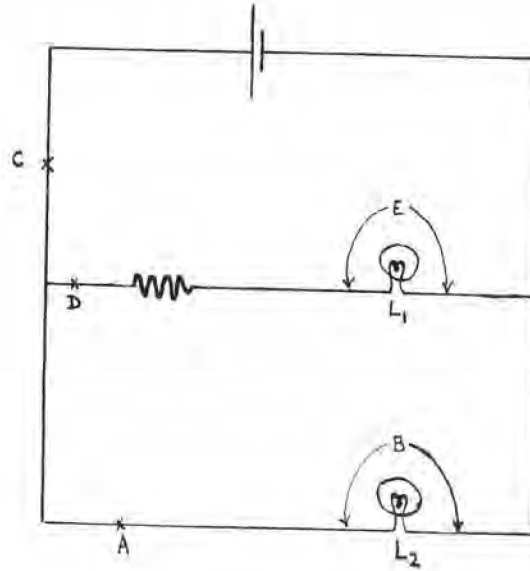
- The thistle funnel tube goes below the level of the liquid in the reaction flask, and the wash bottle is connected the wrong way round.
- The level of the water in the trough is too low, and the tube leading to the wash bottle does not come from below the level of the liquid in the reaction flask.
- The wash bottle is connected the wrong way around, and no level of liquid is shown in the bowl of the thistle funnel.
- The thistle funnel tube goes below the level of the liquid in the reaction flask, and the level of the water in the trough is too low.
- The level of the water in the trough is too low, and the wash bottle is connected the wrong way around.



A substance has a boiling point of  $-180^{\circ}\text{C}$ . In its gaseous state it is less dense than air and soluble in water. From the diagrams above select the one representing the most suitable apparatus by which to collect the gas.



Questions 38, 39 and 40 refer to the following circuit diagram.



For the following questions, indicate the letter denoting the appropriate responses in the blank spaces on the answer card.

38. Indicate where you would place a switch to cut off lamp  $L_2$  only.
39. Indicate where you would place a variable resistor to dim both lamps.
40. Indicate where you would place a variable resistor to dim lamp  $L_2$  only.