

I. E. A.

IEA/10 A

BOOKLET 10

SCIENCE

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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.

SECTION A

1. A student wrote the following note on a laboratory project.

"Using a cork-borer I obtained several cylinders from a large potato. The cylinders were 7 cm long and 0.5 cm in diameter. I kept them on a dry plate and measured them again on the following day. I found that all of them had become shorter and thinner."

The student then put the cylinders into a beaker of tap water and wrote.

"If I measure them tomorrow I shall find that they have all returned to their original size."

In writing this second sentence the student was

- A. making a statement of fact.
- B. making an observation.
- C. drawing a tentative conclusion.
- D. describing an experimental procedure.
- E. making a hypothesis.

2. Which of the following features present in an animal would make you certain it was a mammal?

- A. A vertebral column.
- B. Small tufts of "hair - like" bristles on its skin.
- C. Two pairs of limbs.
- D. Two pairs of milk glands.
- E. Five digits on each fore-limb.

Questions 3 and 4 refer to the following data.

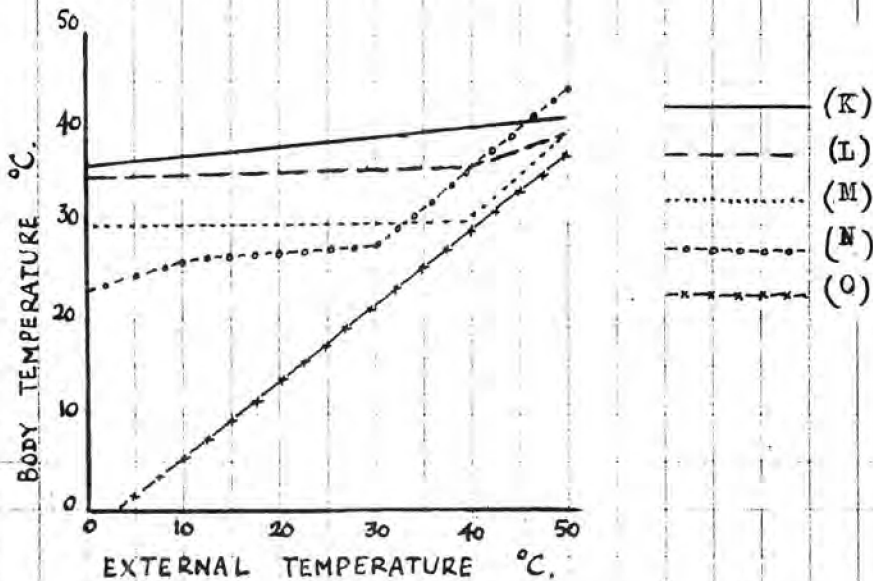
Several different parts of plants were placed in sealed containers of equal volume. The amounts of CO_2 (carbon dioxide) used by the plant parts under different conditions were measured and recorded.

Container	Plant	Plant Part	Vol. of Plant Part (cm^3)	Colour of Light	Temp. ($^{\circ}\text{C}$)	Time Elapsed (days)	CO_2 Used (cm^3)
1	Myrtle	Leaf	100	Red	15	2	150
2	Myrtle	Leaf	100	Red	27	2	200
3	Myrtle	Stem	100	Blue	21	2	50
4	Oak	Root	100	Blue	27	3	0
5	Oak	Leaf	100	Orange	27	2	100
6	Oak	Leaf	100	Orange	27	3	150

Assume that the experimental conditions not listed were identical in all six containers.

3. On the basis of the data in the table, one could properly compare the amount of CO_2 used in one day by
- myrtle leaves at 15°C and at 27°C .
 - myrtle stems and myrtle leaves.
 - myrtle leaves in red light and in orange light.
 - oak leaves in orange light and in blue light.
 - oak leaves at 15°C and at 27°C .
4. Which one of the following statements about the use of CO_2 by oak leaves would be supported by the given data?
- They use more CO_2 in orange light than in blue light.
 - They use more CO_2 at 27°C than at 15°C .
 - They use more CO_2 per day than did the myrtle leaves.
 - They use an average of $50 \text{ cm}^3 \text{ CO}_2$ each day.
 - They use 50 cm^3 of CO_2 each day.

5. The graph shows the results obtained when the changes in body temperature resulting from changes in external air temperature for various animals were being investigated.



Which of these curves is most likely to represent the results obtained from a lizard?

- A. K
 B. L
 C. M
 D. N
 E. O
6. A lizard in a laboratory at 20°C was placed close to three temperature controlled areas, one at a temperature of 50°C, one at a temperature of 37°C and one at a temperature of 15°C. It always moved to the 37°C area.

This behaviour is an example of

- A. a response to a stimulus.
 B. reasoning.
 C. a reflex arc.
 D. geotropism
 E. thigmotaxis

7. 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.
8. Which of the following is a correct statement about hibernating animals?
- A. There is no life in any part of the animal.
 - B. The animal ceases to breathe.
 - C. The animal is absorbing energy for use when it returns to active life.
 - D. The animal's body temperature is higher than when it is active.
 - E. The animal is using less energy than during the period of active life.
9. When 16 g of dilute sulphuric acid was poured onto 3 g of zinc in an open test tube, hydrogen gas was generated. What was the weight of the contents of the test tube after the reaction was completed?
- A. Slightly more than 19 g.
 - B. Slightly less than 19 g.
 - C. Equal to 19 g.
 - D. Slightly less than 16 g.
 - E. Equal to 16 g.
10. A sample of oxygen gas in a plastic bag weighed 0.32 g. A sample of another gas in an identical bag, under the same conditions of temperature and pressure, weighed 0.26 g.

Atomic weight of oxygen = 16.

What is the weight of 1 mole of the second gas?

- A. 13 g.
- B. 26 g.
- C. 48 g.
- D. 58 g.
- E. 64 g.

11. One kind of stainless steel contains approximately 13% chromium and 1% nickel by weight; the rest is iron. Which of the following gives the closest approximation to the ratio of the number of chromium atoms to iron atoms in this stainless steel?

Atomic weight of chromium = 52

Atomic weight of iron = 56

- A. $\frac{13}{52} : \frac{14}{56}$.
- B. $\frac{13}{52} : \frac{86}{56}$.
- C. $\frac{13}{108} : \frac{86}{108}$.
- D. $\frac{13}{(100-52)} : \frac{86}{(100-56)}$.
- E. $\frac{13}{100} \times 52 : \frac{86}{100} \times 56$.

Questions 12-14 relate to the simplified periodic table with main group elements shown below:

Group								
Period	IA	IIA	IIIA	IVA	VA	VIA	VIIA	O
1								
2	F			N	P	Q	T	
3	G	K	L			R		U
4	H		M			S		V
5	I							W
6	J			O				X

12. Which element in the table has the smallest nuclear charge?

- A. F.
 B. U.
 C. J.
 D. X.
 E. T.

13. In the third period of the table, the most metallic element is

- A. G.
 B. K.
 C. L.
 D. R.
 E. U.

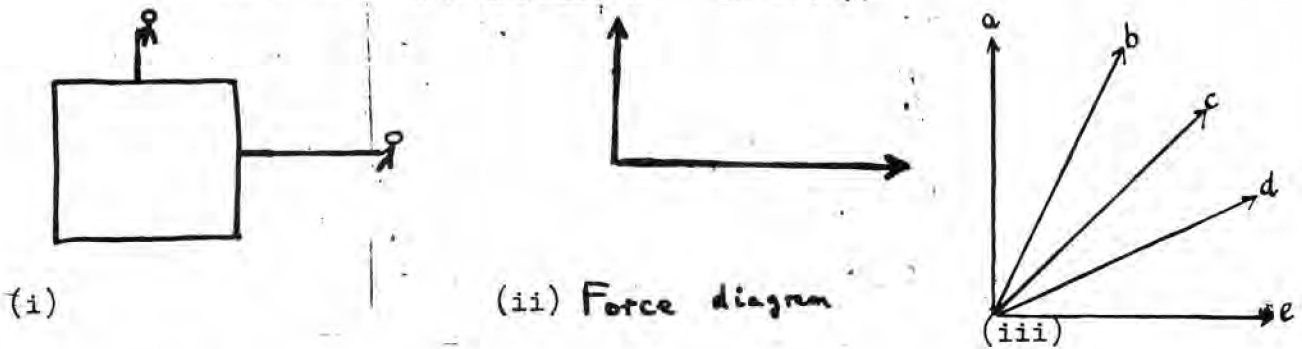
14. Which element in Group IA would most easily form an ion of +1 charge when in the gaseous state?

- A. F.
 B. G.
 C. H.
 D. I.
 E. J.

15. Human respiration can best be described as

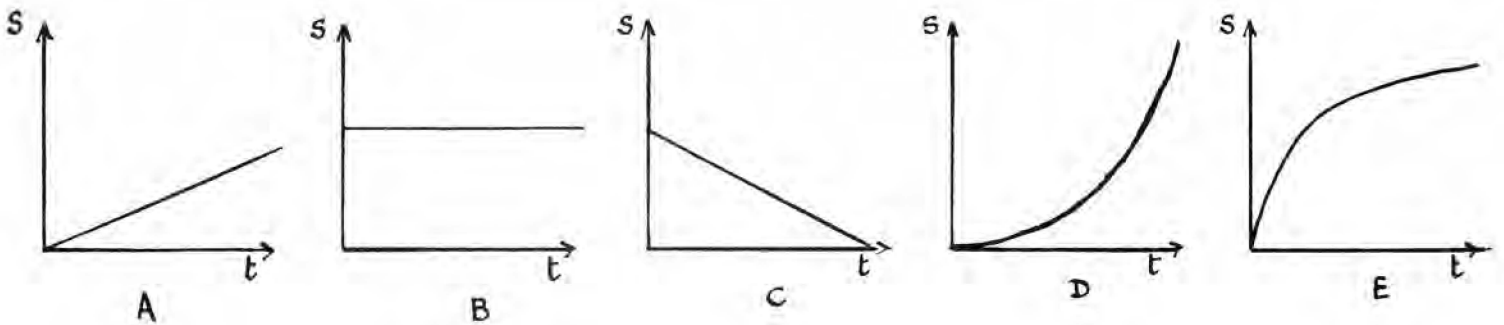
- A. double decomposition.
- B. a gas-phase reaction.
- C. anaerobic respiration.
- D. gaseous diffusion.
- E. slow combustion.

16. Two men pull on a box by ropes as shown in the diagram. The lengths of the arrows on the force diagram are drawn proportional to the magnitude of the forces exerted by the men. In which of the directions shown in the third diagram will box move to tend to move?



- A. a.
- B. b.
- C. c.
- D. d.

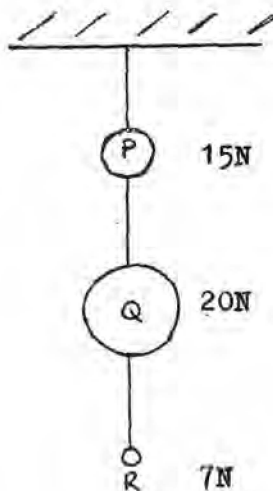
17. A steel ball rolls down an inclined plane. Which of the graphs below best represents the relationship between the distance travelled (s) and the time (t) (Assume retarding forces are negligible).



18. The objects P, Q, and R of weight 15N, 20N and 7N are hung with a light thread as shown in the figure.

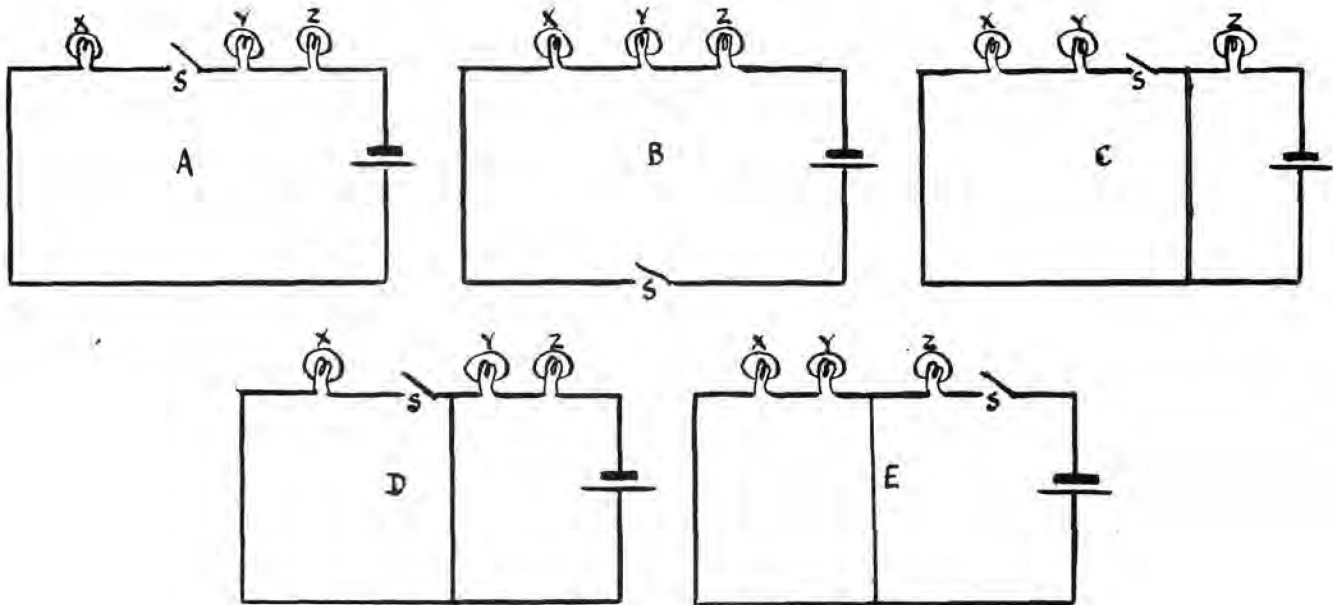
What is the tension in the thread between P and Q?

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



19. Which of the following would occur if a moving atom X were to collide with a stationary atom Y at room temperature?
- A. Both atoms would lose kinetic energy.
 - B. Both atoms would gain kinetic energy.
 - C. Kinetic energy would be gained by atom X and lost by the atom Y.
 - D. The kinetic energy of each atom would remain the same.
 - E. Kinetic energy would be lost by atom X and gained by atom Y.
20. A sensitive mercury-in-glass thermometer registering room temperature is immersed in boiling water. The mercury level first drops slightly and then rises. Why does the drop occur?
- A. The specific heat of glass is greater than that of mercury.
 - B. The coefficient of expansion is greater for glass than for mercury.
 - C. The glass expands before the mercury does.
 - D. At room temperature, mercury has a negative coefficient of expansion like that of water from 0°C to 4°C .
 - E. The surface tension of mercury increases with temperature.

21. 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?



22. Which of the following devices in their common form would not function on a steady direct current?

- A. Electromagnet.
- B. Transformer.
- C. Electric heating element.
- D. Filament lamp bulb.
- E. Electric bell.

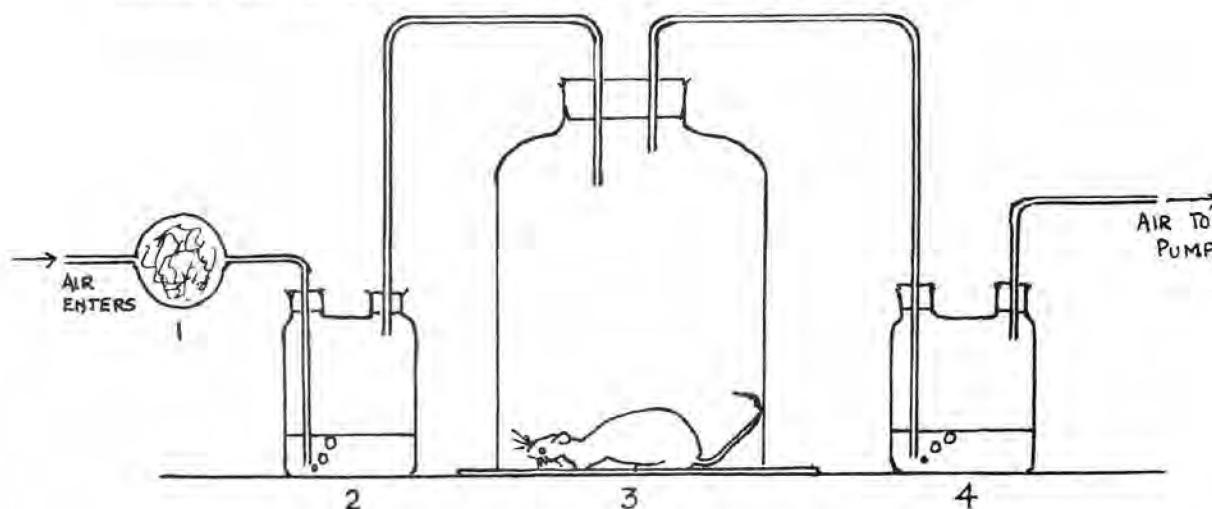
23. The following are all examples of waves -- radiowaves, ultra-violet waves, infra-red waves, light waves, sound waves.

Each type of wave is different in some way from the other four. Which one of the following statements is correct?

- A. Radiowaves are the only waves which carry energy.
- B. Ultra-violet waves are the only waves you cannot see.
- C. Infra-red waves are the only transverse waves.
- D. Light waves are the only waves which travel very fast.
- E. Sound waves are the only longitudinal waves.

24. A radio-active substance has a half life 6 days. What fraction of the original activity of a sample remains after 12 days?
- None of it.
 - $\frac{1}{36}$.
 - $\frac{1}{12}$.
 - $\frac{1}{4}$.
 - $\frac{1}{2}$.

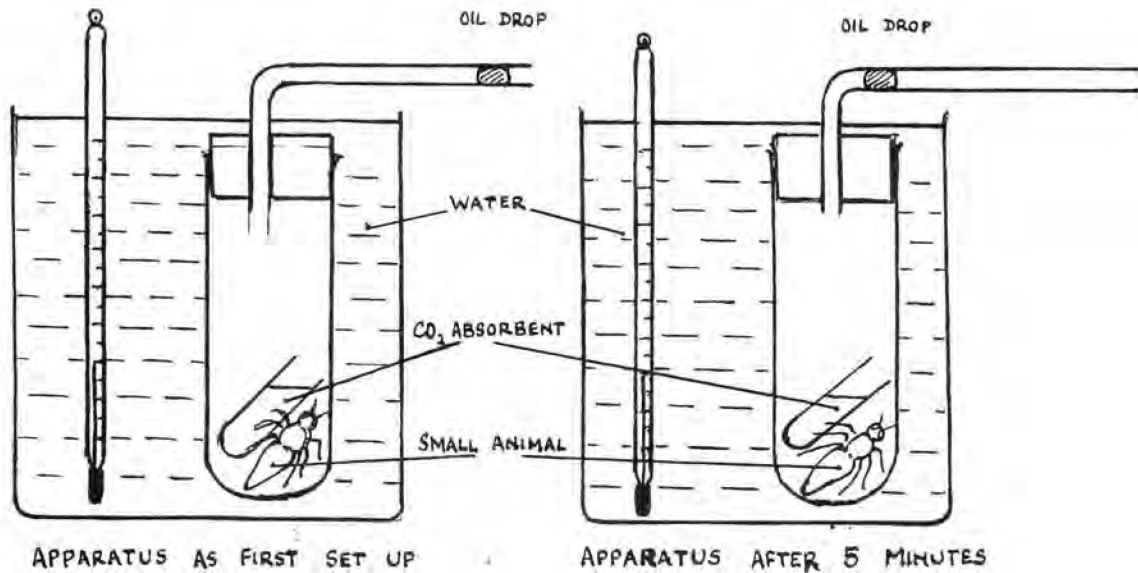
Questions 25 and 26 refer to the following diagram which shows an arrangement of apparatus which can be used to show that an animal gives out carbon dioxide in respiration.



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.

25. 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.
26. 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.

Questions 27 and 28 refer to the following diagram:



APPARATUS AS FIRST SET UP

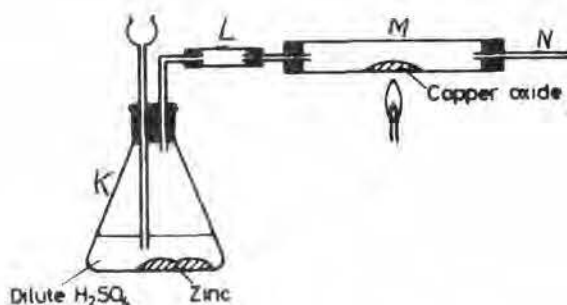
APPARATUS AFTER 5 MINUTES

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

27. 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.
28. 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.

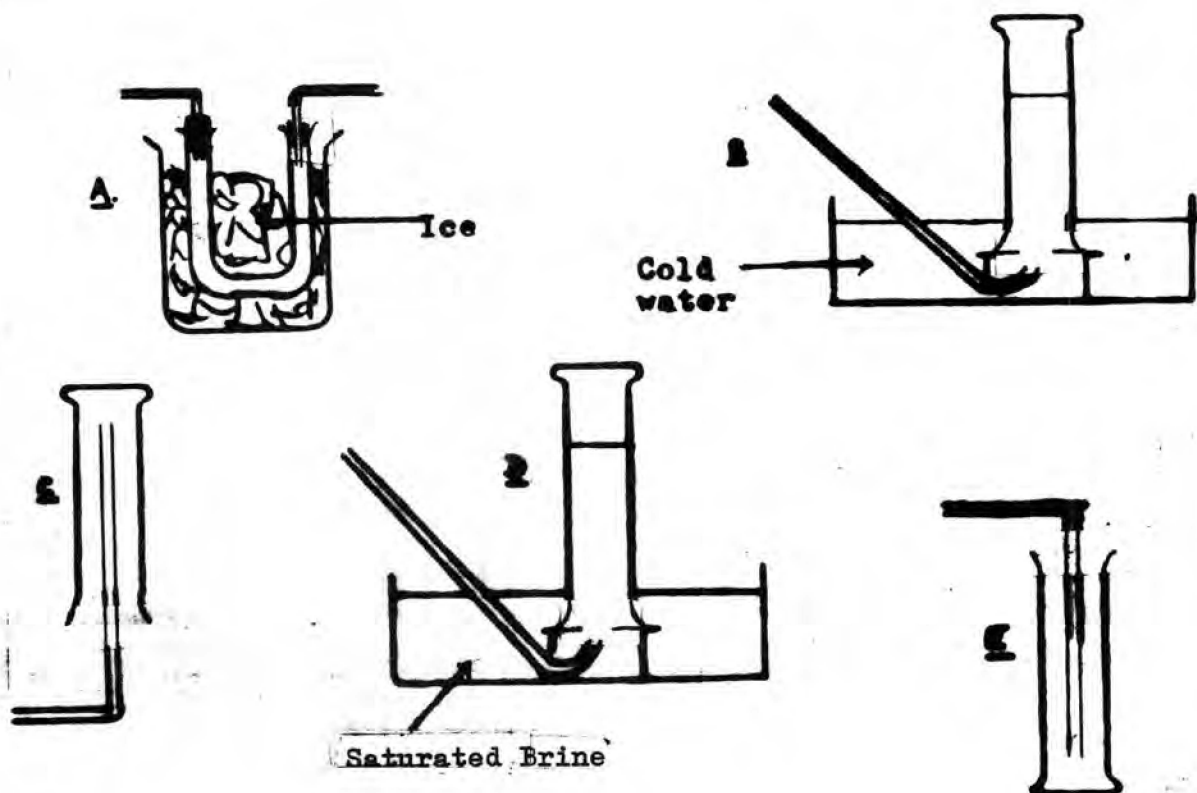
29. A chemist working for a toothpaste firm wishes to prepare 250 cm^3 of a 0.010 molar aqueous solution of stannous fluoride, SnF_2 . Fortunately for him, SnF_2 is soluble in water. One mole of SnF_2 weighs 156.7 g . Equipment available includes a 250 cm^3 volumetric flask, a 10 cm^3 pipette, a 0.01 g sensitivity balance, and a 400 cm^3 beaker.
- Once the proper amount of SnF_2 has been weighed, which one of the following procedures would be best?

- Place the SnF_2 in the beaker and add exactly 250 cm^3 of water from volumetric flask.
 - Place the SnF_2 in the beaker and add exactly 250 cm^3 of water from the pipette in 10 cm^3 portions.
 - Place the SnF_2 in the volumetric flask, dissolve it in less than 250 cm^3 of water, and then dilute to the 250 cm^3 mark.
 - Using the beaker and balance, weigh out exactly 250 g of water and add the SnF_2 to it.
 - Dissolve the SnF_2 in more than 250 cm^3 of water in the beaker mix thoroughly, and then fill the volumetric flask to the line with the solution.
30. 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.



A substance has a boiling point of 21°C . In its gaseous state it is denser than air and soluble in water. From the diagrams above select the one representing the most suitable apparatus by which to collect a sample of the substance.

32. The following apparatus is set out on the laboratory bench: two vacuum (thermos) flasks, two thermometers, two measuring cylinders, a beaker containing 1 M sodium hydroxide solution and a beaker containing 1 M hydrochloric acid.

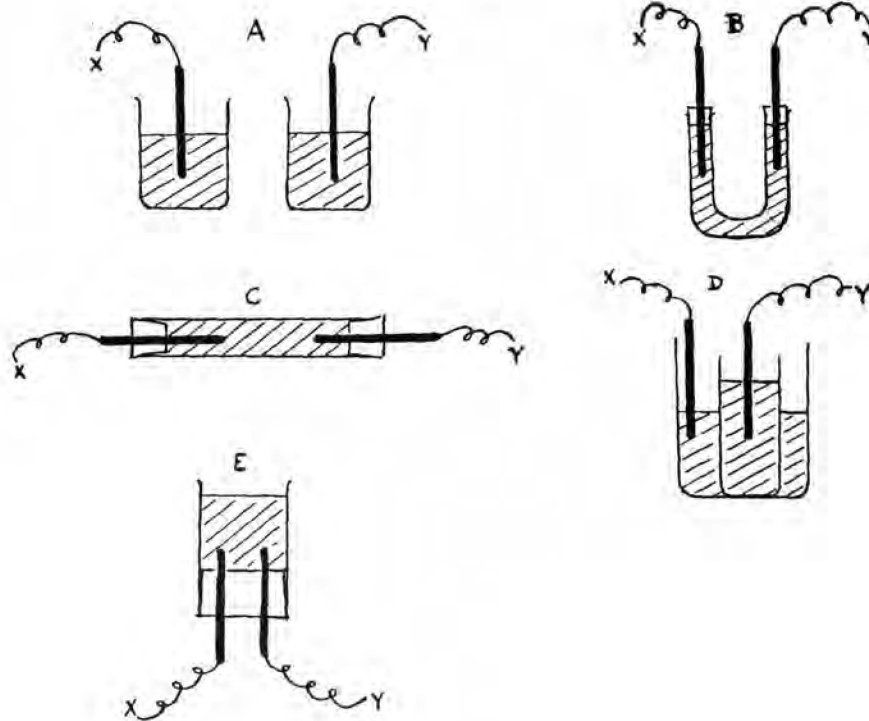
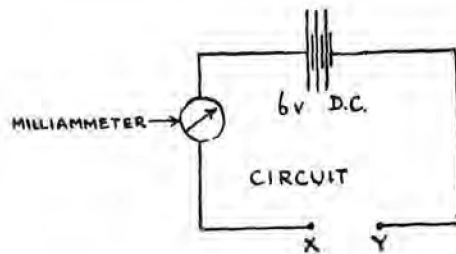
Which one of the following procedures would give most accurately a value for the molar heat evolved in the neutralization of sodium hydroxide and hydrochloric acid?

- A. Take the temperatures of the acid and alkali in their respective beakers, mix them into a vacuum flask and record the rise in temperature produced.
- B. Mix the acid and alkali in one vacuum flask, record the temperature, transfer the contents to the second flask and record any change in temperature.
- C. Allow all the acid and half the volume of alkali to come to steady recorded temperatures in the respective vacuum flasks, mix them and record the temperature rise produced.
- D. Allow equal volumes of acid and alkali to come to steady recorded temperatures in the respective vacuum flasks, mix them and record the temperature rise produced.
- E. With a known volume of acid in the one vacuum flask, record the temperature at regular intervals of time as alkali is added from the other flask.

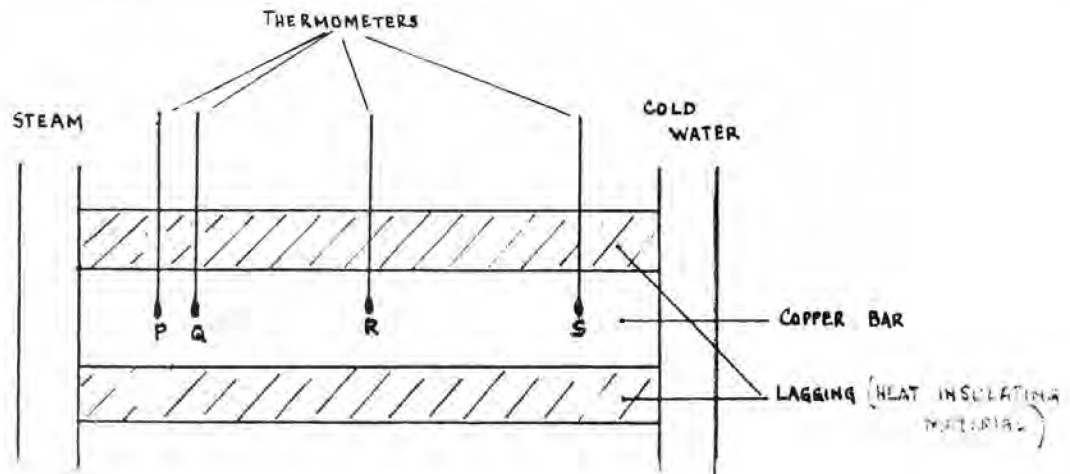
33. A number of different solutions have to be tested to find out whether or not they will each conduct electricity and, if so, what products are liberated.

Using the circuit shown below, which of the 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.)



34. 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.

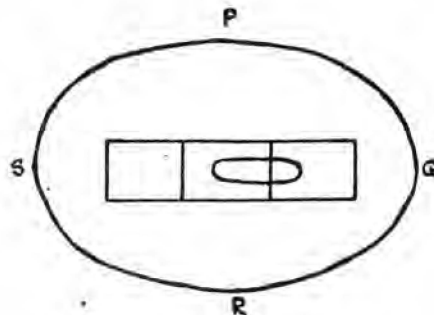


The temperature falls uniformly along the bar, and it is required to find the temperature gradient, or fall in temperature for unit length.

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 R
 - E. R and S
35. 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?

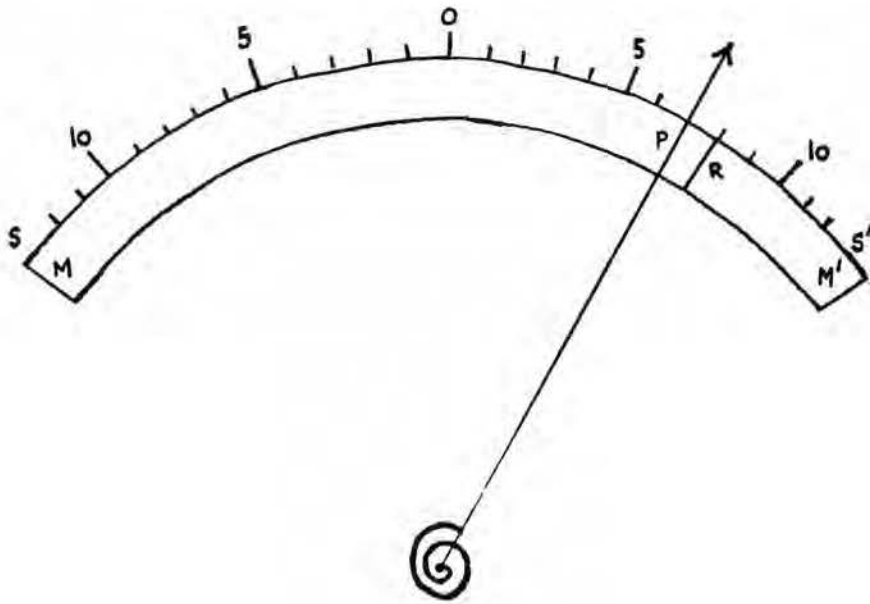
- A. P
- B. Q
- C. R
- D. S
- E. any of the above



36. 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 BOOKLET 10