

A.A/A.A.A.

60 (2)

2

Candidate's Index Number.....

(BOLD FIGURES)

Candidate's Name and Initials.....

(BLOCK CAPITALS)

Name of Examination Centre.....

ROYAL AIR FORCE

EXAMINATION FOR THE ENTRY OF AIRCRAFT APPRENTICES

9th February, 1960

(2) SCIENCE

Time allowed—1 hour 15 minutes

INSTRUCTIONS

1. Write your index number, name and examination centre in the spaces at the top of this page.
2. This paper is in two sections. You should answer **TWELVE QUESTIONS** from Section I and **FOUR QUESTIONS** from Section II. All questions in Section I carry equal marks. All questions in Section II also carry equal marks.
3. Write the answers, and show any necessary working, in the spaces provided beside the questions in Section I and below the questions in Section II.
4. Do not waste time on a question which you cannot answer. Leave it and go on to the next question.
5. DO NOT WRITE ON ANY OTHER PAPER.

SECTION I

ANSWER **ANY TWELVE** QUESTIONS FROM THIS SECTIONTake $g = 32$ ft. per sec. per sec.

1	(a) Change a velocity of 120 yds. per min. into ft. per sec. (a) (b) Change an acceleration of 120 yds. per min. per min. into ft. per sec. per sec. (b)
2	(a) How much work is done in riding a bicycle 1 mile against an average resistance of 10 lb. wt. ? (a) (b) What horse power is expended in lifting 660 lb. through a vertical height of 50 ft. in 5 min. ? (b)
3	A mass of 13 lb. is moving with an acceleration of 32 ft. per sec. per sec. What is the magnitude of the force producing this motion (a) in poundals : (a) (b) in lb. wt. ? (b)
4	(a) Complete the following statement :— In a magnet, like poles unlike poles..... (b) Name one substance from the following which can be strongly magnetised :— glass, brass, ebonite, silver, nickel, copper, zinc. (b)
5	Complete the following statements :— (a) A transformer can be used to step a up or down. (b) A machine for converting electrical energy into mechanical energy is called a
6	Calculate the current in a "60 watt 240 volt" lamp, when used in a 240 volt supply.
7	(a) Complete the following statement :— The coefficient of linear expansion of a bar is the increase in per unit per unit rise in (b) What is the shape of the bolt-holes in the joints connecting the lengths of rail in a railway track ? (b)
8	Complete the following :— (a) The heat of the sun is transferred to the earth mainly by

9	(a) What rise in temperature on the Fahrenheit scale corresponds to a rise of 1° Centigrade? (b) What type of thermometer is used in Polar regions?	(a) (b)
10	Complete the following statements :— (a) An echo is the repetition of a sound caused by..... (b) If the pitch of a note is raised one octave, the frequency of vibration is.....	
11	Complete the following statement :— The amount of light received from a luminous source varies.....as the from the source.	
12	Draw a horizontal line to represent a plane mirror and a line to represent a ray of light from the left, impinging on a mirror at an angle of approximately 45° . Show the reflected ray and the normal at the point of contact. Indicate the angle of incidence (i) and the angle of reflection (r).	
13	Give the chemical names of two of the following substances :— Common Salt..... Baking Powder..... Saltpetre..... Chalk..... Epsom Salts.....	
14	How many grams of aluminium can be extracted from 102 grams of aluminium oxide (Al_2O_3)? (Atomic wt. : Al = 27 ; O = 16.)	
15	Which of the following substances are mixtures? Chalk..... Chlorine..... Sal Ammoniac..... Air..... Graphite..... Water-gas.....	
16	Which muscle is used when— (a) bending the fore arm ; (a) (b) straightening the fore-arm ? (b)	
17	Name two basic shapes of bacteria.	
18	What is the essential difference between a seed and a plant spore?	

SECTION II

ANSWER **ANY FOUR** QUESTIONS FROM THIS SECTION

Mechanics

19

(a) Find the water pressure at the bottom of a dock when the depth of water is 10 ft. (Density 62.5 lb. per cu. ft.)

(b) What is the total force on the dock-gate with this depth of water, if the width of the gate is 25 ft. ?

20

(a) A load of 6 cwt. is freely suspended by means of a rope attached to an overhead beam. If a horizontal force of 2.5 cwt. is applied to the load, what will be the tension in the rope ?

(b) A body weighing 4 lb. slides down a smooth plane inclined at 30° to the horizontal. Find the component of the weight acting down the plane.

Magnetism and Electricity

21

Three cells having internal resistances of 0.3, 0.3 and 0.4 ohms and e.m.f's. of 1.5, 1.5 and 2.0 volts respectively, are connected in series with an external resistance of 89 ohms. Calculate the current in the circuit.

22

(a) Complete the following statements :—

(i) When a current is produced in a coil of wire by means of relative motion between the coil and a magnet, the current is said to be

(ii) If the relative motion is a continuous to-and-fro motion, the current is an current.

(b) Draw a simple diagram of a step-up transformer.

23

Heat

(a) If 112 calories are absorbed in raising the temperature of 100 grams of silver by 20° , calculate the specific heat of silver.

(b) How many calories are required to convert 100 grams of water at 30° C. into steam at 100° C. ?
(Latent heat of steam = 537 calories per gram.)

24

(a) Complete the following statement :—

778 ft. lb. of work when completely converted will produce one of heat.

(b) What horse-power would be developed by an engine using 1 lb. of fuel per min., the heating value of the fuel being 11,000 B.T.U.s per lb.? Assume the whole heat energy of the fuel to be converted into useful work.

Light and Sound

25

Show, by means of a sketch, how a wire tightly stretched between two fixed points vibrates when sounding its fundamental note. Show also, by means of a dotted line on your sketch, how the wire vibrates when sounding its first harmonic. Mark with a cross the position of each node.

26

(a) Images are "real" or "virtual", "magnified" or "diminished" and "erect" or "inverted". Which of these terms would you apply to the images obtained with convex mirrors?

(b) An object $1\frac{1}{2}$ in. high is placed 1 in. directly in front of a convex lens, having a focal length of 3 in. Draw a diagram to scale (full size) showing the image in position. What is the height of the image and its distance from the lens?

Chemistry

27

(a) Express the following statements in the form of chemical equations:

(i) Magnesium burns in oxygen to form magnesium oxide.

(ii) When carbonic acid is heated it decomposes into water and carbon dioxide.

(i)

(ii)

(b) Write down the chemical equations for the following reactions:—

(i) heat on mercuric oxide;

(ii) dilute hydrochloric acid on calcium carbonate;

(iii) dilute sulphuric acid on zinc.

(i)

(ii)

(iii)

28

A fragment of sodium is added to cold water :—

- (a) How does the fragment of sodium behave ?
- (b) Write down the chemical equation representing the reaction.
- (c) Give the chemical name of the newly-formed solid.

(a)

(b)

(c)

Biology

29

- (a) What is the purpose of the " fat-body " in an amphibian or an insect ?
- (b) What are the main food constituents of the " fat-body " ?

(a)

(b)

30

- (a) Give the names and respective colours of the two different and distinct kinds of blood pigment occurring in animals.

- (b) What are the chief differences in appearance and function of

(i) arterial blood

and

(ii) venous blood